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ABSTRACT

This instructor's guide contains the materials required to teach a competency-based introductory course in insulation to students who have chosen to explore careers in construction. It contains three units: instructional unit includes some or all of the basic components of a unit of instruction: performance objectives, suggested activities for the instructor, extensions and options, information sheets, student supplements, transparency masters, instructional supplements, assignment sheets, job sheets, practical tests, written tests, and answers to assignment sheets and written tests. Academic skills training is combined with vocational training throughout the instructional materials, and a system of icons has been used to help instructors identify activities into which training in the following basic skill areas has been infused: reading, science, creative thinking/problem solving, writing, oral communication, employability, math, interpersonal skills, and social studies. Most units of instruction are designed for use in more than one lesson or class period of instruction. These materials precede the instructional units: information on basic skills in curriculum, information on measuring student performance gains, and required criteria for a competency-based education program. A basic skills documentation matrix and competency profile are provided at the end of the manual. (YLB)

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Introduction To Insulation

Developed as a Cooperative Project by
the Associated General Contractors of America
William W. Brown, Chairman, Manpower and Training Committee
and
Curriculum and Instructional Materials Center,
Oklahoma Department of Vocational and Technical Education

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Introduction To Insulation

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FOREWORD

In 1985, The Associated General Contractors of America (AGC) met with representatives of the Oklahoma Curriculum and Instructional Materials Center (CIMC) to discuss the possibilities of developing, as a cooperative project a course of instruction designed for training individuals who choose to seriously explore careers in construction.

This revised publication is the result of those original discussions and updates made through close coordination among general contractors and vocational educators. This series represents conscious effort to coordinate the practical experience of personnel in the carpentry industry with the best instructional methods of those in the field of vocational education.

Although this book reflects a systematic approach to instructional materials development and the latest in educational technology innovations, the information in the Introduction To Insulation manual should be adapted and modified to coincide with local conditions.

Roy Peters, Jr.
State Director
Oklahoma Department of Vocational
and Technical Education

William. W. Brown, Chairman
Manpower and Training Committee
The Associated General Contractors
of America

PREFACE

Construction requires that students have many skills and related information to become productive workers in this challenging field. Workers must be better trained and equipped to find and retain meaningful employment.

Instructional materials in this manual is written in terms of student performance, using measurable behavioral learning process. Criterion-referenced evaluation instrument provide for a uniform measurement of student progress.

The purpose of this manual is to assist instructors in all construction related areas in providing instruction throughout the industry. Any information in this manual that does not concur with the instructor's course of study should be modified to meet personal needs.

Personnel safety is of prime concern, as an instructor you are encouraged to closely observe and couch students in all safety issues. We have done much to advise students of possible dangers, but your close supervision and alertness can't be overemphasized.

Al Willey
Curriculum and Instructional
Materials Center
Oklahoma Department of Vocational
and Technical Education

ACKNOWLEDGEMENTS

Much appreciation is expressed to the many individuals who contributed their time, talents, and knowledge in the revision of this manual.

Thank you to the following ad hoc committee members, AGC staff representatives, and the staff of the Oklahoma Department of Vocational and Technical Education.

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USE OF THIS PUBLICATION
INSTRUCTIONAL UNIT

Introduction to Insulation contains three units. Each instructional unit includes some or all of the basic components of a unit of instruction: performance objectives, suggested activities for the instructor, extensions and options, information sheets, students supplements, transparency masters, instructional supplements, assignment sheets, job sheets, practical tests, written test, and answers to assignment sheets and written test, all of which are included in the instructor's edition. The student workbook includes the objective sheets, information sheets, student supplements, transparency masters, assignment sheets, and job sheets. Written tests may be duplicated for classroom use or *additional copies* may be purchased by calling 1-800-654-4502 or, in Oklahoma, 1-800-522-5810, ext. 589.

All of the unit components tie into measurable and observable learning outcomes. Instructors are encouraged to supplement these components with other resources in order to make them as responsive to local conditions and individual needs as possible.

Most units of instruction are designed for use in more than one lesson or class period of instruction. Careful study of each unit of instruction by the instructor will help him or her determine the following:

- Amount of material that can be covered in each class period.
- Skills that must be demonstrated.
  - Supplies and equipment needed
  - Amount of class time needed for demonstrations
  - Amount of time needed for student practice
- Supplementary materials, including print and non-print media, that must be ordered.
- Resource people who must be contacted.

Objective Sheet (White Pages)

Each unit of instruction is based on the performance needed for successful employment in an occupational area. Performance objectives are stated in two forms. The unit objectives states the overall goal of the unit. It tells what the student should be able to do and what standard will be used to see whether the student can do it. Specific objectives outline the teaching sequence of the competencies required to meet the unit objective.

The objectives should be provided for students and stressed throughout the teaching/learning process. This will help answer any questions concerning performance requirements for each instructional unit. The objectives can also help determine teaching strategies and instructional methods. Instructors should prepare for each unit by deciding how each objective could be best taught.

Instructors should feel free to modify, delete, or add objectives in order to meet the needs of the students and community. When objectives are added, the instructor should remember to supply the needed information, assignment and/or job sheets, and criterion-referenced test items.

Suggested Activities (Pink Pages) – **Instructor's Edition only**

The suggested activities page assists the instructor during the preparation stage of the teaching/learning process by providing suggestions for delivery, application, and evaluation during the instructional process. The instructor should read the suggested activities prior to introducing the unit to allow time to obtain supplemental materials, prepare audiovisual materials, and contact outside resources. Duties of the instructor will vary according to the particular unit.

References used in the development of each unit are listed in the "Suggested Resources" section, along with print and non-print media that may be used to teach the unit. These materials can be used by the instructor to supplement his or her knowledge of the subject area or to help students with particular interests or occupational objectives in the area covered.

Extensions and Options (White Pages) – **Instructor's Edition only**

Extensions and Options are supplemental material that is not testable or graded and is nice-to-know. Extensions and Options provide the instructor with additional activities, fact sheets, art, controversial items, and extra practice sheets. They may also include items for the gifted or remedial student. Extensions and Options are used at the discretion of the instructor.

Information Sheets (Green Pages)

The information sheet provides "must know" content essential for meeting the cognitive objectives stated at the beginning of each unit. It serves as an excellent guide for presenting background knowledge necessary to develop the skills specified in the unit objective.

Students should read the information sheet before it is discussed in class. Space is provided in margins for students and instructors to add notes that clarify and/or expand on the information provided.

The information sheet may include notes, cautions, or warnings. These should be discussed carefully and thoroughly. **Notes** are short verbal additions to the information sheet or procedural outline that provide nice-to-know and decision-making information. A note may tell the student what to watch for or to consider at a given step. It may explain when a step may not be applicable. Notes offer guidance that may help the student understand the process and do it more efficiently. **Cautions** are advisories that tell the student how to avoid causing minor personal injury or equipment damage. **Warnings** are advisories to the student used to avoid serious personal injury or death to the student, persons in the workplace, or users of the project or the procedure.

Student Supplement (Green Pages)

Student supplements include instructions that could be used for solving problems or reinforcing the enrichment of learning. The information presented in a student supplement may consist of tables, charts, written information, forms, or other information students will need in order to complete one or more of the assignment or job sheets. While supplements are not tested over directly, they may be used to assist in meeting the performance objectives.

Transparency Masters (White Pages) - **Instructor's Edition only**

Transparency masters provide information in a special way. The students may see as well as hear the materials being presented, thus reinforcing the learning process. Transparencies may present new information or they may reinforce information presented in the information or assignment sheets.

Transparencies should be made and placed in the notebook where they will be immediately available for use. Transparencies direct the class's attention to the topic of discussion. They should be left on the screen only when topics shown are under discussion.

Instructional Supplements (Pink Pages) — **Instructor's Edition only**

Instructional Supplements provide suggestions for teaching the basic skills included in each assignment sheet or job sheet. They are located directly in front of the components they support–assignment or job sheets–in each unit.

Assignment Sheets (Tan Pages)

Assignment sheets provide students with information and exercises that address learning levels at or above the application level of Bloom's taxonomy. Assignment sheets provide written exercises for instruction and practice of a specific objective. The introduction to the assignment sheet explains how the assignment sheet relates to the subject area and unit component for such information.

Assignment Sheet Answers (Pink Pages) – **Instructor's Edition only**

This component is designed to assist the instructor in evaluating student performance on assignment sheets.

Job Sheet (Blue Pages)

Job Sheets are another important segment of a unit of instruction. The job sheets provide a list of equipment, tools, and materials needed to complete a manipulative or psychomotor skill. They describe a step-by-step procedure to complete each task or job. Diagrams, photographs, and illustration are provided to assist students in achieving the skill.

The instructor should demonstrate the procedure outlined in each job sheet. Furthermore, the instructor needs to localize the procedure according to the equipment and supplies available in the local lab or salon situation. Job sheets also furnish potential employers with a picture of the skills being taught and the performances they might reasonably expect from a person who has had this vocational instruction.

Practical Tests (Yellow Pages) – **Instructor's Edition only**

The practical tests are designed to assist the instructor in the evaluation of the psychomotor activities (job sheets). The practical test provides instructors with a valid mechanism for determining a student's level of ability in performing the procedure stated on the job sheet. The check-off list allows instructors to evaluate a student's process performance of the task on the job sheet. The overall competency indicator allows the instructor to evaluate the end product.

Written Test (Yellow Pages) – **Instructor's Edition only**

This component provides criterion-referenced evaluation of every objective listed in the unit of instruction. If objectives have been added, deleted, or modified, appropriate changes should be made on the test.

In order to measure and document student competency gains as required by the latest Carl Perkins regulations, and as outlined in the Oklahoma-developed system of standards and measures, it is *absolutely essential* that the same test be used as a pretest and as a posttest. If you choose to use tests other than the ones included herein, be sure that the same instrument is used for each activity–pre- and post test.

A detailed explanation of the Oklahoma plan for standards and measures and the Carl Perkins requirements is included in the CIMC publication, *Measuring Learning & Competency Gain: The Pretest/Posttest Approach.* This booklet and accompanying software designed to assist in calculating and recording student gains are available to all vocational teachers through the school's vocational testing liaison.

To further assist vocational teachers, the CIMC is in the process of developing test code sheets for each written test in its more recent publications, including this one. These code sheets are explained in Section 8 of the publication mentioned above, and will greatly assist in verifying that the test is a valid instrument for measuring student learning and competency gains. As the test code sheets for programs become available, they will be forwarded to teachers of each program; further publications will include the test code sheets.

Written Test Answers (Pink Pages) – **Instructor's Edition only**

This component is designed to assist the instructor in evaluating student performance on written tests.

COMPETENCY PROFILES

A competency profile is in the front of each publication. Competency profiles document student performance. The profile contains a list of the specific job competencies that a student should achieve before leaving the training program.

PAGE NUMBERING

Each publication for the Curriculum and Instructional Materials Center is usually assigned a specific abbreviation. ***Introduction to Insulation*** has not been abbreviated. Each unit will be recognized by the unit number in Arabic numerals. Each unit in the publication begins with page 1. Each page number gives the component name, book title, unit number, and page number within the unit. Since some CIMC publications are loose-leaf, this system of page numbering was recently adopted so that pages from different manuals would not get mixed up. The page number for the objective sheet in Introduction to Sheet Metal, which is unit 2, would look like this:

OBJECTIVE SHEET - **Introduction to Insulation**
CIMC - A2 - 1

METHODS OF DISSEMINATING MATERIAL

For best results, provide student materials for each student. Student workbooks contain objective sheets, information sheets, supplements, transparency masters, assignment sheets, and job sheets. Pretest, practical tests, and written tests are packaged separately for students, and can be stored until needed. Students should be allowed to take their materials home at the end of the course.

TEACHING METHODS

Keeping students motivated is a challenge. Supplement the objectives by providing the "why," personal experiences, and current information. If you are going to teach the material in a group setting, prepare for the unit be deciding the best way to teach each objective and allow for student input.

If you are going to follow the plan for individualized instruction, provide opportunities that will allow each student to become involved in planning for and being responsible for his or her own education.

CORRECTIONS AND SUGGESTIONS

The Curriculum and Instructional Materials Center (CIMC) wants to provide vocational instructors and students with materials that are accurate and effective. Although the CIMC strives to maintain the highest standards of development and production, oversights occasionally do occur. If you find any errors in this or other CIMC publications, or have suggestions for improving their usefulness in vocational programs, please notify the CIMC staff. One easy way of pointing out errors is to make a photocopy of the affected page and to indicate the correction on the copy. Mail this information to the CIMC, where it will be used to correct the publication before the materials are reprinted.

To ensure that the material is updated on a timely basis, notify the CIMC of necessary corrections as soon as possible after discovering the error. Do not assume that someone else will notice the error and inform the CIMC; other users may be making the same assumption. Please send corrections and recommendations for improving this publication to the following address:

Coordinator of Development
Curriculum and Instructional Materials Center
Oklahoma Department of Vocational and
Technical Education
1500 West Seventh Avenue
Stillwater, Oklahoma 74074-4364

For a free catalog, a list of new publications, or other instructional materials information call 1-800-522-5810, extension 589.

RESALE

BASIC SKILLS IN CURRICULUM

The CIMC has always been mindful of the importance of reinforcement (and sometimes remediation) of students' academic skills as they progress through vocational training, and has always included activities in its materials to enhance and promote use of these skills.

Recent state and federal legislation mandates vigorous basic skills development in vocational education in the wake of demands by industry that workers *must* be academically, as well as technically, competent, given the nature of the highly complex work place. In response, the CIMC has taken the following steps to document that, indeed, the instructional materials *do* combine academic skills training with the vocational training. In addition, concerted efforts have been made to "beef up," or enhance the basic skills instruction already present. Following is a brief description of those processes:

Basic Skills Icons and Enablers

To assist teachers and students in identifying activities that promote basic skills development, the CIMC has implemented a marking system that uses simple graphic symbols, or icons, and a list of specific tasks, or enablers, to identify the basic skill or skills that are called for in each job or assignment sheet.

Each of the nine broad skills areas—reading, writing, mathematics, science, oral communication, interpersonal or relating, creative thinking and problem solving, employability, and social studies—is represented by the icon presented below.

Reading

Science

Creative Thinking/ Problem Solving

Writing

Oral Communication

Employability

Math

Interpersonal or Relating

Social Studies

When an activity involving one of these basic skills is identified, the corresponding icon is placed in the left-hand margin of the job or assignment sheet. The basic skills training is further defined by retrieving the specific, or enabling, skill that is required by consulting a list of over two hundred and fifty enablers that has been compiled and grouped with each general basic skill. This enabling skill is placed directly below the icon.

As an example, an exercise that requires a student to conduct library research would make necessary the use of specific reading comprehension and research and reference skills. The basic skills that the exercise promotes would be depicted in the left-hand margin as follows:

ASSIGNMENT SHEET | ***PLANNING LIVING SPACE FOR HUMAN NEEDS*** | **1**

Name _____ Score _____

OBJECTIVE 10 **Define personal territory.**

INSTRUCTIONS

Reading Comprehension
- Gain factual information

Functional Reading
- Follow written instructions
- Use content area vocabulary

Language
- Use standard grammar, spelling, and capitalization
- State ideas clearly

- As discussed in Objective 1, each person has an invisible "space bubble" or comfort zone. A comfort zone is the space between oneself and others that brings a feeling of well-being. When one's comfort zone is crowded or invaded, discomfort often results. Therefore, personal territory needs should be a prime consideration when planning living space.
- For each of the following situations, draw your estimated comfort zone around the figures provided.
- Indicate how many inches from your body the comfort zone extends.
- Consider how that comfort zone changes in different situations. Answer the questions that follow.

Basic Skills Documentation Matrix

Another component of the CIMC basic skills instructional plan is the "Basic Skills Documentation Matrix." The matrix graphically summarizes the basic skills training included in the vocational program, unit by unit. It should be helpful to teachers in planning their instruction, and to administrators as documentation that basic skills **are** being addressed during the vocational training.

The matrix for this publication is included as an 8½" by 11" foldout in this *Instructor's Manual.*

Matrices have been developed for most CIMC publications. For more information on those available for other programs, call the CIMC at 1-800-654-4502.

Instructional Supplement

The supplement is a tool for the instructor to use in helping students apply the basic skills in Assignment Sheets and Job Sheets. Some supplements are appropriate for use with all students; some are for use only with those students who do not understand the academic skills called for in the exercise.

MEASURING STUDENT PERFORMANCE GAINS

When you examine this book, you will notice that separate written pretests are no longer included in the units of instruction. Each CIMC unit now contains only a single Written Test. This test should be used as **both** pretest and posttest by giving it once before students start a unit and again when they have completed the unit.

The reason for using a single instrument as both pretest and posttest is so that direct comparison of each student's competencies before and after instruction can be made accurately. This comparison enables precise calculation, documentation, and evaluation of student **performance gains**.

Accurate performance gains analysis is an important requirement of the new Carl Perkins legislation for vocational education. Teachers can make an important contribution to the performance accountability mandated by the new federal legislation by carrying out accurate performance gains analysis for their students, and making this data available to students, parents, and administrators.

This analysis is easy to do and requires only simple calculations and record keeping. Detailed information regarding performance gains analysis is contained in the CIMC publication, *Measuring Learning & Competency Gains: The Pretest/Posttest Approach.* In addition, the CIMC has developed a computer program, CARL, which will perform all necessary calculations and will print out a record form of all information required for gain score analysis. Copies of CARL and the publication are available through your local testing liaison (in Oklahoma), or from the CIMC at 1-800-654-4502.

REQUIRED CRITERIA FOR A COMPETENCY-BASED EDUCATION PROGRAM

Criterion	Discussion	CIMC component meeting criterion
1. Instruction is based on clearly-stated learning objectives that are: a) observable and measurable, and b) communicated in writing to students before instruction begins.	Learning objectives drive CBE. Objectives are the "competencies" that learners must achieve. Each objective must clearly state what *learners* must *do* to demonstrate acquired skill or knowledge. Verbs in learning objectives are active and precise, stating the exact performance expected of learners. The objectives should also specify the standard or level of performance required. Objectives can be at any level of Bloom's Taxonomy and can include the cognitive, psychomotor, and affective domains. Higher-order cognitive skills should be included.	Objective Sheet
2. Instruction is aligned with the stated learning objectives	In CBE, the objectives specify what is taught. "Content" should relate to one or more objectives. The curriculum should cover all objectives with relevant information.	Information Sheet
3. There is a student evaluation system that is: a) criterion-referenced, and b) aligned to the learning objectives and the curriculum.	In CBE, the aim is to bring the performance of *all* learners up to a pre-defined standards and competencies. Learners work on each competency until they achieve "mastery"; the evaluation system should test and record this mastery. Learners can restudy and retest as often as needed. Specific remediation activities should also be available to learners when needed. The evaluation system focuses on what each student has achieved, not on what the instructor has "taught." The "constant" in CBE is student performance; the "variables" are time and resources. (This differs from traditional systems where learners get one chance at mastery; some succeed and some fail. In such systems, time and resources are constant and student achievement is variable.) If an evaluation is criterion-referenced, successful learner performance is defined by (or *referenced* to) mastery of pre-set objectives and standards (or *criteria*): there must be a careful match (or *alignment*) between what the student should master (objectives), what is taught (curriculum), and what is tested. Objectives, curriculum, and evaluation system must all match.	Written Test and Job Sheet/Skill Test

Criterion	Discussion	CIMC component meeting criterion
4. There is an observable management system of cognitive skill practice that provides for, promotes, and documents mastery learning.	For both cognitive and psychomotor skills, a CBE program must have a system of maintaining records of which skills and activities each learner has completed, which ones are in progress, and which ones have not yet been completed. Completion means "mastery"; no skill is completed until the learner has achieved the mastery level. The record system should promote feedback on student skill attainment to *both* instructor and learners, provide for remediation as needed, and encourage reevaluation of learner performance until mastery is achieved. Appropriate remediation strategies often should consider learning styles and other individual differences among learners. Learners should work on skills and activities until they achieve mastery. They should not be "passed on" without mastery. While learners may move ahead and work on other skills (i.e those for which all prerequisite skills have been mastered or those without prerequisites), work should also continue on the skills still requiring mastery. Students should not attempt higher-order skills until all prerequisite skills are mastered.	Assignment Sheet
5. There is an observable management system of psychomotor skill practice that provides for, promotes, and documents mastery learning.		Job Sheet/Skill Test
6. Skill mastery records are maintained for each learner, and learners have access to and make use of these records to monitor their skill acquisition.	Records should clearly indicate the skills each learner has mastered. One such record should profile or list the competencies that have been mastered and those to be mastered. Other performance indicators can be added and kept in a portfolio for each learner. Learners should have ready access to their portfolios to monitor their own progress in skill mastery and competency attainment.	Competency Profile

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This information will be used to correct the publication before the materials are reprinted. To ensure that the material is updated on a timely basis, notify the CIMC of necessary corrections as soon as possible after discovering the error.

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1500 W. 7TH AVE
STILLWATER OK 74074-9907

OBJECTIVE SHEET	INSULATION MATERIALS	A I

INTRODUCTION

Energy conservation will continue to be a major issue in the design and construction of buildings. This unit describes the types and uses of insulation and vapor barriers..

PREREQUISITES

Fundamentals of Construction

UNIT OBJECTIVE

After completing this unit, the student will be able to recognize and define types of insulation and vapor barriers. The student will show this knowledge by completing the assignment sheet and written test with a minimum score of 85 percent.

SPECIFIC OBJECTIVES

After completing this unit, the student will be able to:

1. Given a list of terms associated with insulation, match them to their correct definitions.
2. From alternatives, choose the correct functions of the two basic kinds of insulation.
3. Select from a list benefits of using insulation in a structure.
4. Given drawings, identify types of insulation.
5. From a list, choose areas where insulation should be used.
6. Select factors that determine the amount of insulation needed for walls, ceilings, and floors.
7. Make a selection of the types of materials used as vapor barriers.
8. Select from a list the methods used to apply insulation and vapor barriers.
9. Estimate the materials required to insulate a structure. (Assignment Sheet)

SUGGESTED ACTIVITIES	INSULATION MATERIALS A I
PREPARATION	• Review unit and plan presentation. • Order or obtain materials needed to supplement unit. • Introduce unit. • Demonstrate the effectiveness of insulation in sound- and heat-transfer reduction with simple examples such as ear plugs, comparing temperatures measured by a thermometer near a heat source with one protected by thermal insulation, etc. • Discuss common uses of insulation outside construction, such as in water heaters in refrigerators, and under the hoods of cars. Emphasize that these materials insulate against sound as well as heat. • Display literature and advertisements from insulation companies or public utilities promoting the use of insulation.
DELIVERY	**Objective 1: Given a list of terms associated with insulation, match them to their correct definitions.** • Discuss terms and definitions associated with insulation. • Show the class a model or wall cross-section to clarify definitions. **Objective 2: From alternatives, choose the correct functions of the two basic kinds of insulation.** • Discuss the functions of the two basic types of insulation. • Exhibit samples of both thermal and acoustical insulation. • Provide the class with plans specifying each type of insulation and discuss their applications.

Objective 3: Select from a list benefits of using insulation in a structure.

- Discuss the benefits of using insulation in a structure.
- Ask the students to read articles or literature from insulation manufacturers and distributors to expand the discussion.
- Demonstrate the benefits listed in this section of the Information Sheet.

Objective 4: Given drawings, identify types of insulation.

- Discuss types of insulation commonly used in residential construction.
- Show the class samples of each type of insulation discussed in this section of the Information Sheet.
- Have an insulation installer discuss the procedures involved in installing each type of insulation, the advantages and disadvantages of each type of insulation, and the types of insulation used in your area, especially any not covered in the Information Sheet.

Objective 5: From a list, choose areas where insulation should be used.

- Discuss areas where insulation should be used in construction.
- Take the class to visit construction sites to show them where insulation is used. Have each student make a list of the places where insulation was used and the types of insulation used.
- Emphasize the need for insulation at any location where heat exchange is likely, and demonstrate air leaks at windows, outlets, etc. Have students compare the lists they made at the job site and add to their lists if necessary.

Objective 6: Select factors that determine the amount of insulation needed for walls, ceiling, and floors.

- Discuss factors that determine the amount of insulation needed for walls, ceilings, and floors.
- Demonstrate how the three factors discussed in this section of the Information Sheet are interrelated.
- Show the class Supplements 1-4 to relate temperature and comfort level to insulation requirements.
- Have students or groups of students ask a utility company or other agency to perform an energy audit of their homes; each student should then prepare a report comparing the results of the energy audit to the cost of fuel and the cost of insulation.
- Have an insulation installer talk to the class and compare the costs of insulating new construction to insulating an existing structure.

Objective 7: Make a selection of the types of materials used as vapor barriers.

- Discuss materials used for vapor barriers.
- Provide students with samples of various types of materials discussed in this section of the Information Sheet.

Objective 8: Select from a list the methods used to apply insulation and vapor barriers.

- Discuss methods used to apply insulation and vapor barriers.
- Use Transparencies 1 through 3 to supplement your discussion.
- Demonstrate each method discussed in this section of the Information Sheet and relate each method to specific types of insulation.

Objective 9: Estimate the materials required to insulate a structure. (Assignment Sheet)

- Discuss how to estimate the number of packages of insulation needed to insulate a structure.
- Emphasize the types of insulation materials commonly used in your area.
- Discuss the Assignment Sheet.
- Have students complete the Assignment Sheet.

EVALUATION

Pretest

- Give written test as pretest.
- Determine individual study requirements from pretest results.
- Counsel students individually on pretest results and study requirements.
- Modify materials in unit or create supplementary materials for individual students as required.

Skill Test

- Evaluate students on assignment sheet activities.
- Evaluate students on job sheet activities.
- Complete appropriate section of competency profiles.
- Reteach and reevaluate if necessary.
- Modify materials in unit or create supplementary materials for individual students as required.

Written Test

- Explain to students that they will be asked to demonstrate on the written test actions listed in the specific objectives.

- Give the written test.

  NOTE: The written test may be given in sections if desired.

- Complete appropriate sections of competency profiles.

- Reteach and retest if necessary.

- Review individual and group performance in order to evaluate teaching methods. Adjust scope, sequence, or instructional approaches for additional lessons as required.

SUGGESTED RESOURCES

Print Media

- Willis H. Wagner. *Modern Carpentry*. The Goodheart-Willcox Company, Inc.: South Holland, IL.

UNIT REFERENCES

- Willey, Al. *Residential Carpentry*. Oklahoma Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, and The Associated General Contractors of America: Stillwater, OK, 1993.

- Toenjes, Leonard P. *Building Trades Dictionary*. American Technical Publishers, Inc.: Homewood, IL, 1989.

- Wagner, Willis H. *Modern Carpentry*. The Goodheart-Willcox Company, Inc.: South Holland, IL.

INFORMATION SHEET	INSULATION MATERIALS	A I

OBJECTIVE 1

Given a list of terms associated with insulation, match them to their correct definitions.

- **acoustics** — science of sound waves
- **condensation** — process by which vapor becomes liquid
- **insulation** — material used as a barrier to inhibit thermal and sound transmission
- **moisture penetration** — process by which moisture moves into a structure
- **perimeter** — outside boundary of a space
- **perimeter insulation** — insulating material installed at the perimeter of foundation or floor slab of a structure
- **R-value or R-factor** — an industry standard used to define insulation effectiveness
- **reflective insulation** — material that limits transmission of heat by means of foil backing material
- **thermal** — relates to the temperature of air
- **vapor barrier** — non-porous material that retards passage of moisture into or through structural elements

OBJECTIVE 2

From alternatives, choose the correct functions of the two basic kinds of insulation.

NOTE: Basically, two kinds of insulation are used in construction: thermal and acoustical.

- **thermal insulation** — limits the transfer of heat from inside a structure to the outside and from the outside into the structure

- **acoustical insulation** — Absorbs sound waves and prevents passage of sound

OBJECTIVE 3 **Select from a list benefits of using insulation in a structure.**

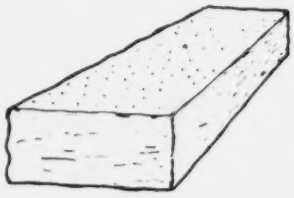
- Prevents rapid temperature changes
- Reduces heating and cooling expenses
- Retards or resists the spread of fire
- Prevents condensation
- Reduces noise transfer
- Helps absorb sound waves

OBJECTIVE 4 **Given drawings, identify types of insulation.**

NOTE: There are many types of insulation other than those listed below. Examples of other types of insulation include lightweight aggregates such as vermiculite, perlite, blast furnace slag, burned clay products, and cinders. Aggregates are commonly used in plaster and concrete to improve the insulating qualities of these materials.

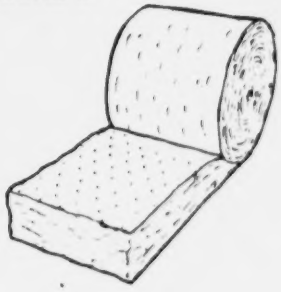
- Flexible batt insulation (roll)

FIGURE 1



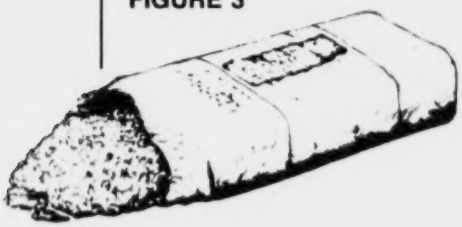
- Flexible batt insulation (with and without paper backing)

FIGURE 2



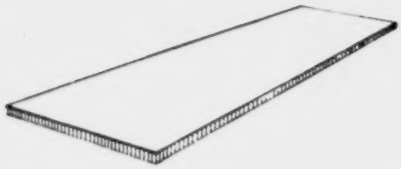
- Loose-fill insulation

FIGURE 3



- Rigid board insulation*

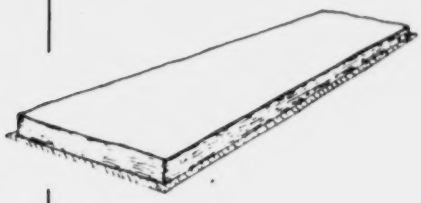
FIGURE 4



***NOTE:** Often used on exterior of framing wall, under slabs, and under slabs on-grade.

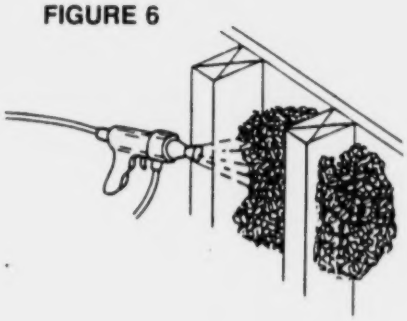
- Reflective insulation

FIGURE 5



- Adhesive-type insulation

FIGURE 6

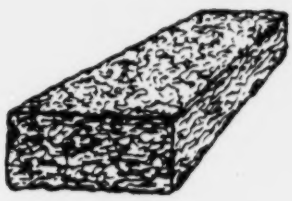


- Corrugated-paper insulation

FIGURE 7

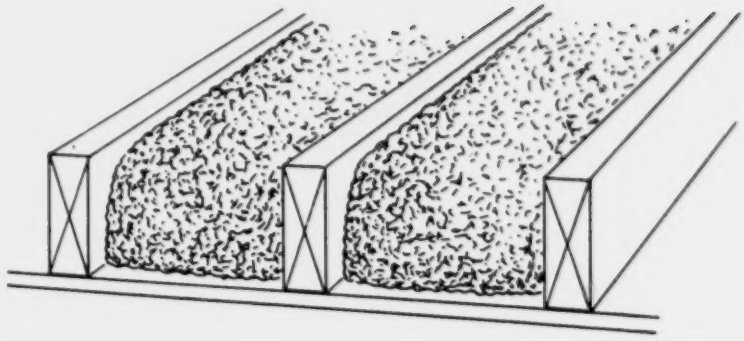
- Friction-batt insulation

FIGURE 8



- Blown-in insulation

FIGURE 9



OBJECTIVE 5 **From a list, choose areas where insulation should be used.**

In general, insulation should be used where any structural surface is exposed to thermal exchange, such as:

- Around perimeter of concrete floors and foundations
- Between floor joists
- Between wall studs
- Above ceilings
- Around windows and exterior doors
- Around exposed air ducts
- In roof structure

NOTE: In the roof structure, the vapor barrier must always face the heated area (toward interior), and for proper air circulation, the air space must always be maintained between the insulation and the roof sheathing.

OBJECTIVE 6

Select factors that determine the amount of insulation needed for walls, ceilings, and floors.

1. Average low and high outside temperatures

   Although the average low temperature is normally used as the basis for determining insulation requirements, the average high temperature of an area should also be considered in warm climates to prevent loss of cool inside air and penetration of hot outside air.

2. Level of comfort desired

   Comfort level refers to the inside temperature that must be maintained for personal comfort. Comfort levels are generally divided into three standards: the all-weather standard, the moderate standard, and the minimum standard. To meet the all-weather standard, the amount of insulation provided must be adequate to maintain a desired temperature even during periods of extreme outside temperatures. To meet the moderate standard, the insulation provided must be adequate to maintain a desired temperature during periods of average outside temperature extremes.

3. Cost

   When determining the amount of insulation needed, compare the insulation cost to the cost of fuel needed to maintain a given comfort level; also include in your comparison the cost of materials and labor and the interest paid on the increased cost.

4. Design of structure

   Space available to install insulation

OBJECTIVE 7

Make a selection of the types of materials used as vapor barriers.

NOTE: Many insulation materials and interior surface materials are backed with vapor barriers which when installed properly are usually sufficient to resist moisture penetration. The following materials are used as vapor barriers either singly or in combinations.

- Asphalt-coated paper — often used below roofing or beneath exterior siding
- Aluminum foil
- Polyethylene or plastic film
- Roll roofing

OBJECTIVE 8

Select from a list the methods used to apply insulation and vapor barriers.

- Stapled

  NOTE: Insulation and vapor barriers may be stapled down with either a hand-held or power stapler.

- Nailed

  NOTE: Either a hammer or a pneumatic nailer may be used in nailing insulation and vapor barriers.

- Pressed in place and held with mastic
- Hand-poured (loose fill)

  NOTE: Loose-fill material is often hand-poured.

- Blown in (loose fill)

  NOTE: Loose-fill material may be blown in place.

- Sprayed on (adhesive type)

  NOTE: Adhesive-type material is sprayed on. Ensure proper safety gear is worn, per manufacturer's requirements.

- Laying rigid insulation below slab

- Rolled out and taped at joints

  NOTE: When polyethylene film or roll roofing is installed, the material should be lapped at least 6 inches on all edges. As an alternative, edges may be taped rather than lapped.

- Vapor barriers can be integrated into the insulation or installed after the insulation. They are always placed on the warm or heated side of walls or ceilings.

OBJECTIVE 9

Estimate the materials required to insulate a structure. (Assignment Sheet)

NOTE: When estimating materials, round up to the next even foot and then to the unit of packaging.

1. Calculate square footage of exterior walls to be insulated.

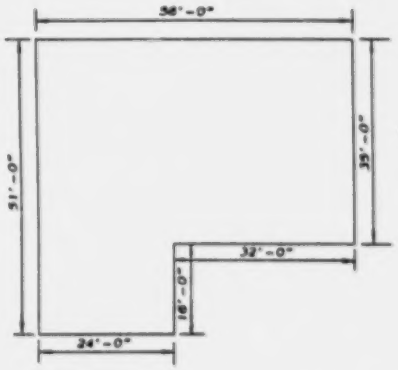
   a. Determine from plans length of perimeter of each exterior wall.

b. Add lengths of all walls to find the structure's total perimeter.

EXAMPLE: If walls of a structure are 56 feet, 35 feet, 32 feet, 16 feet, 24 feet, and 51 feet — (Figure 10), then

56′ + 35′ + 32′ +
16′ + 24′ + 51′ = 214′ = Structure's Total Perimeter

FIGURE 10



c. Multiply total perimeter by ceiling height to find total square footage of walls.

EXAMPLE: If the total perimeter of a structure is 214 feet and the wall height is 8 feet, then

214′ × 8′ = 1,712 sq. ft. = Total Square Footage of Exterior Walls

d. Determine from plans the total square footage of each opening.

e. Add the square footage of all openings to find total square footage of openings.

f. Subtract total square footage of openings from total square footage of walls to find square footage of walls to be insulated.

EXAMPLE: If the total square footage of walls is 1,712 square feet and the total square footage of openings is 174 square feet, then

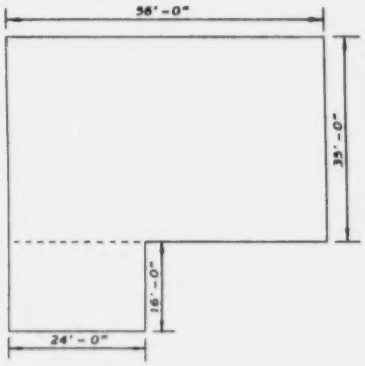
1,712 sq. ft. – 174 sq. ft. = 1,538 sq. ft.
= Square Footage of Exterior Walls to Be Insulated

2. Calculate square footage of ceilings to be insulated.

NOTE: The square footage of floor to be insulated is the same as the square footage of ceiling to be insulated.

a. Divide ceiling into rectangular or square areas and determine from plans the length and width of each area. (Figure 11)

FIGURE 11



b. Multiply length times width to find square footage of each ceiling area.

EXAMPLE: If there are ceiling areas of 56′ × 35′ and 24′ × 16′, then

56′ × 35′ = 1,960 sq. ft.
24′ × 16′ = 384 sq. ft.

c. Add the square footage of all areas to find total square footage.

EXAMPLE; If there are ceiling areas of 1,960 square feet and 384 square feet, then

1,960 sq. ft. + 384 sq. ft. = 2,344 sq. ft.
= Total Square Footage of Ceilings to Be Insulated

3. Calculate total square footage of area to be insulated — Add square footage of exterior walls to be insulated to square footage of ceilings.

EXAMPLE: If the total square footage of exterior walls is 1,538 square feet and the total square footage of ceilings is 2,344 square feet, then

1,538 sq. ft. + 2,344 sq. ft. = 3,882 sq. ft.
= Total Square Footage of Area to Be Insulated

4. Calculate packages of insulation needed to insulate structure.

a. Determine number of packages needed to cover square footage of area to be insulated.

NOTE: Insulation packaging varies considerably with different manufacturers, types of materials, R-factors, and width and thicknesses of materials. See the table.

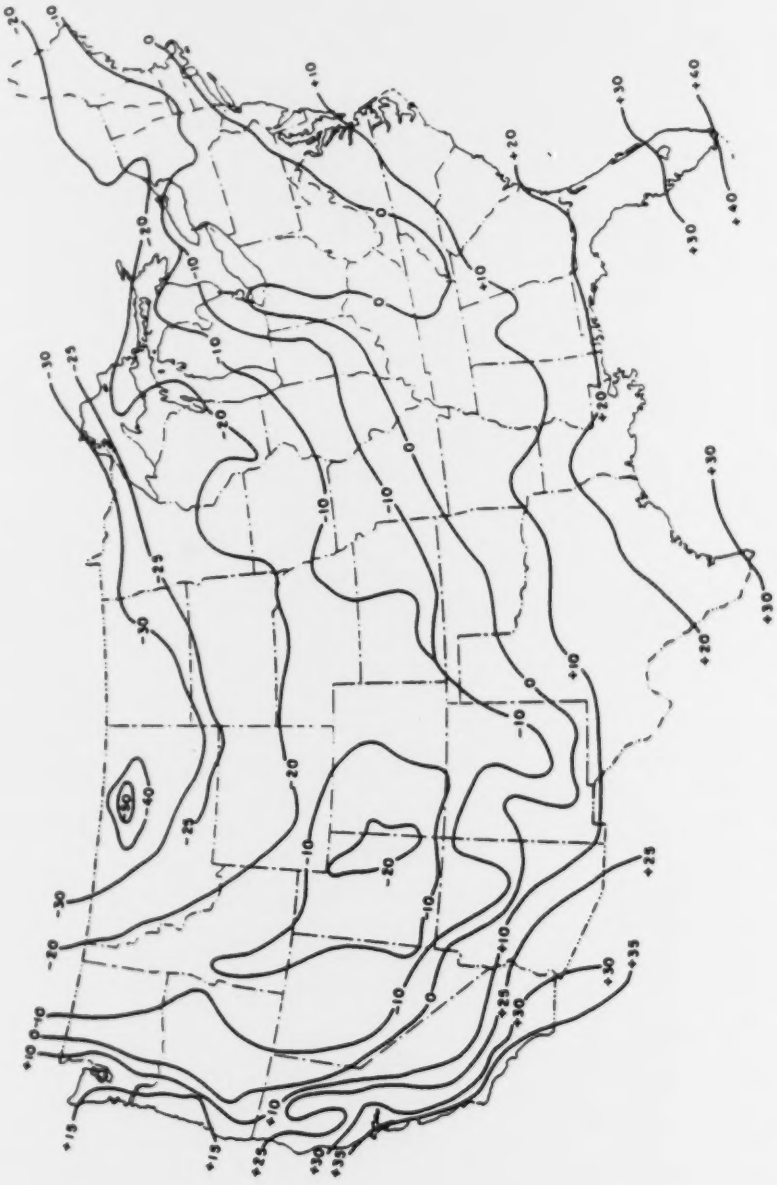
TABLE 1: Coverage of Insulation in Packaging by Various Manufacturers

R-Value	Thickness	Width	Length	Total Coverage
38	12″	16″	48″	32 sq. ft. per pkg
38	13″	16″	48″	64 sq. ft. per pkg
19	6½″	15″	39½″	49 sq. ft. per pkg
19	6¼″	15″	94″	48.96 sq. ft. per pkg
19	6½″	15″	24″	120 sq. ft. per pkg

b. Divide square footage of area to be insulated by amount of coverage per package to find the number of packages of insulation needed.

NOTE: Consider the stud and joist spacing—some structures may be built with stud/joist at 24″ OC. Use 22″ width insulation for these structures.

AVERAGE LOW TEMPERATURES IN THE UNITED STATES



R-VALUES PER INCH FOR VARIOUS TYPES OF INSULATION MATERIALS

Material	R-Value per Inch
Polyisocyanurate	7.2
Extruded styrene	5.2
Asphalt shingles	4.8
Expanded polystyrene	4.0
Cellulose	3.8
Fiberglass (batts)	3.2
Rock wool	3.0
Fiberglass (loose fill)	2.2
Fir, pine	1.3
Glass	0.9
Brick	0.2
Cement plaster	0.2

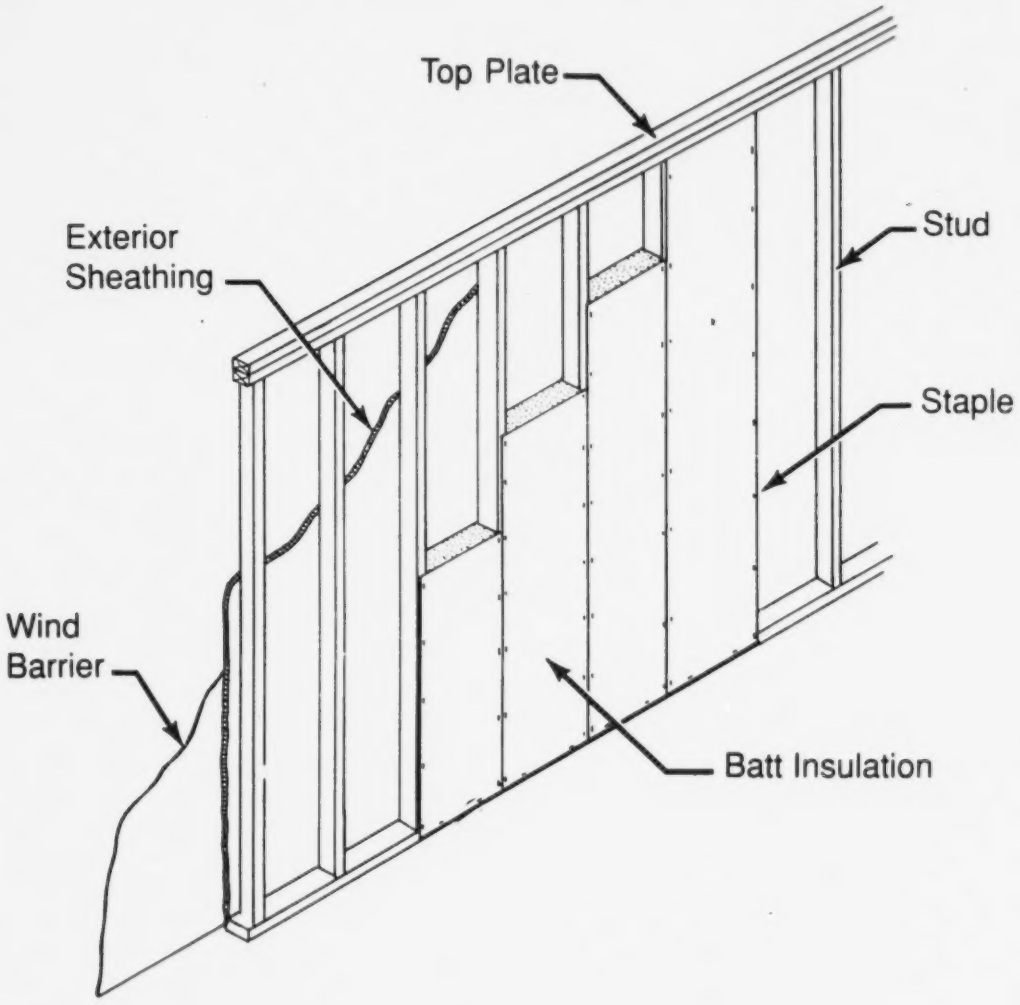
INSULATION MATERIALS

Classification	Material	Comments
Mineral	Rock Slag Glass Vermiculite	Rock and slag are used to produce "wool" by grinding and melting the materials and blowing them into a fine mass
Vegetable (natural)	Wood Sugar cane Corn stalks Cotton Cork Redwood bark Sawdust or shavings	Many vegetable products are processed and formed into various shapes, including blankets and rigid boards
Plastic	Polystyrene Rubber	—
Metal	Foil Tin plate Copper Aluminum	Metallic insulating materials are generally applied to rigid boards or papers and are used primarily for their reflective value

INSULATION MATERIALS R-VALUES REQUIRED TO MEET COMFORT STANDARDS

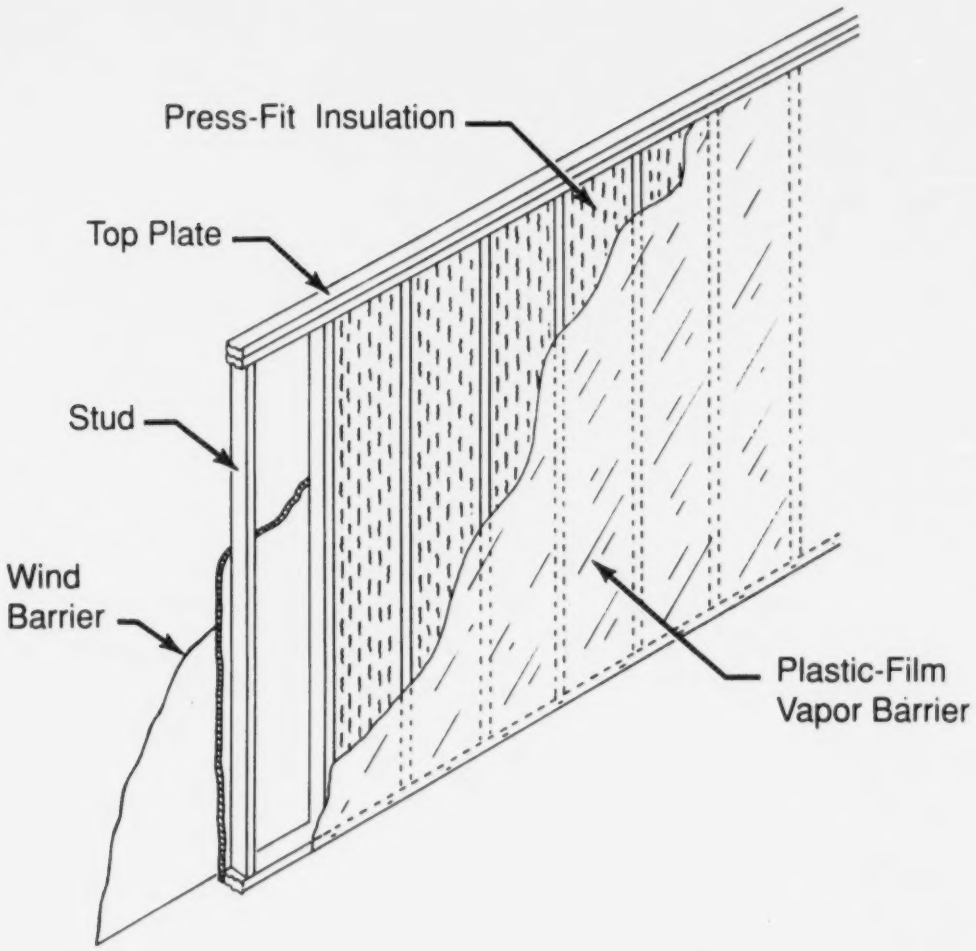
Standard	Insulation Location	Insulation R-Value
All-weather comfort standard	Walls	R 19
	Ceilings	R 30
	Floors	R 19
Moderate comfort standard	Walls	R 13
	Ceilings	R 26
	Floors	R 13
Minimum comfort standard	Walls	R 11
	Ceilings	R 19
	Floors	R 11

Installation Methods



Wall section with batt insulation
(with integral vapor barrier)

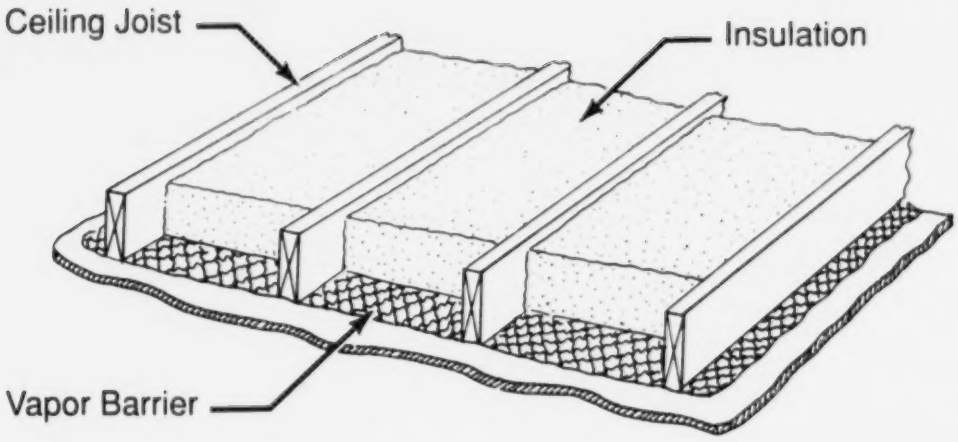
Installation Methods
(Continued)



Wall section with press-fit insulation

votech

Installation Methods
(Continued)



Ceiling with fill insulation

ASSIGNMENT SHEET	INSULATION MATERIALS	A I

Name _____ Score _____

OBJECTIVE 9

Estimate the materials required to insulate a structure.

INTRODUCTION

The insulation installer must practice estimating insulation materials because so many things must be considered. There are many different types of insulation materials, most of which may be applied in various forms, such as batts, loose fill, and rigid. Additionally, the amount of material required to obtain a particular R-factor must be considered as well as the most effective placement of that material.

INSTRUCTIONS

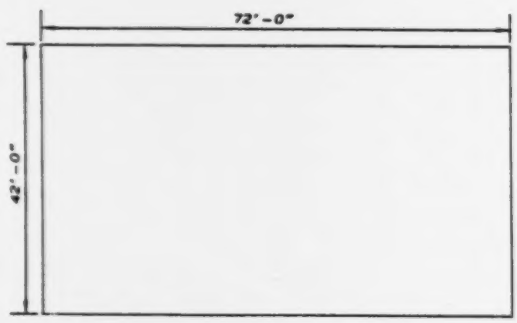
Use the illustrations and dimensions given to estimate insulation materials needed for each application method described. Show your work. Round all numbers to next highest unit.

Functional Reading Skills
- Interpret graphics and symbols

Operation and Calculation Skills
- Calculate with whole numbers
- Calculate with fractions
- Solve formulae and equations

Math Application Skills
- Use English and metric measures

1. Estimate insulation materials needed for the structure illustrated below. The building will be constructed with a crawl space, 8′-0″ wall height, and 178 square feet of wall openings.



a. Packages of R-19 insulation required for walls at 49 square feet per package = _____ packages

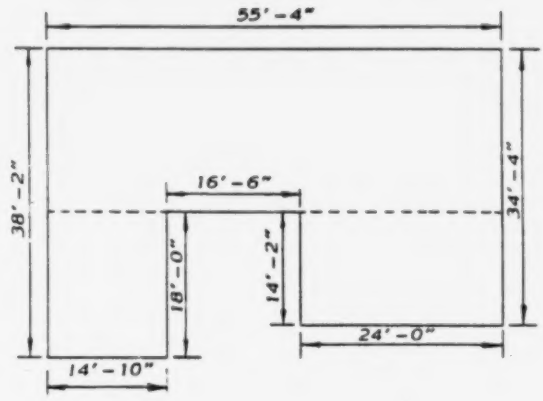
votech

Job Acquisition/
Development Skills
- Master specific job task/procedure

b. Packages of R-38 insulation required for ceiling at 64 feet per package = _____ packages

c. Packages of R-19 insulation required for floor at 49 square feet per package = _____ packages

2. Estimate wall and ceiling insulation for the structure illustrated below. Finished wall height is 8'-0" and total area of wall openings is 220 square feet.



a. Wall area to be insulated = _____ square feet

b. Number of rolls of R-19 batt insulation required for walls with 120 square feet per roll = _____ rolls

c. Ceiling area to be insulated = _____ square feet

d. Number of packages of loose-fill insulation for R-38 in the ceiling if each package will cover 64 square feet = _____ packages

ASSIGNMENT SHEET

1. a. 34
   b. 48
   c. 62
2. a. 1,501
   b. 13
   c. 1,721
   d. 27

WRITTEN TEST

INSULATION MATERIALS — A I

Name _____ Score _____

OBJECTIVE 1

Given a list of terms associated with insulation, match them to their correct definitions. Write in the letter corresponding to the most correct answer.

_____ 1. The industry standard used to define insulation effectiveness is known as

a. R-factor
b. I-factor
c. heat "rads"
d. Btu

_____ 2. What is the process by which vapor becomes a liquid?

a. Evaporation
b. Thermal transfer
c. Temperature inversion
d. Condensation

_____ 3. The science of sound waves is called

a. reflective waves
b. acoustics
c. transformation
d. thermal transfer

_____ 4. Material used to retard the passage of moisture into or through structural elements is known as a/an

a. vapor barrier
b. thermal layer
c. acoustical barrier
d. wind barrier

May be photocopied for student use.

_____ 5. A term that relates to air temperature is

a. acoustic
b. perimeter
c. thermal
d. condensation

_____ 6. Insulation installed at a structure's foundation is known as _____ insulation.

a. base
b. structural
c. perimeter
d. ceiling

OBJECTIVE 2

From alternatives, choose the correct functions of the two basic kinds of insulation.

_____ 1. The function of thermal insulation is to

a. retard the passage of moisture
b. absorb moisture
c. limit the transfer of heat
d. limit sunlight penetration

_____ 2. Acoustical insulation is primarily used to

a. deflect sound waves
b. cool a structure
c. prevent passage of moisture
d. absorb sound waves

OBJECTIVE 3

Select from a list benefits of using insulation in a structure.

_____ 1. Which of the following is a benefit of using insulation in a structure?

a. Increases heating and cooling costs
b. Retards or resists the spread of fire
c. Encourages condensation
d. Increases building cost

May be photocopied for student use.

_____ 2. A benefit of using insulation is

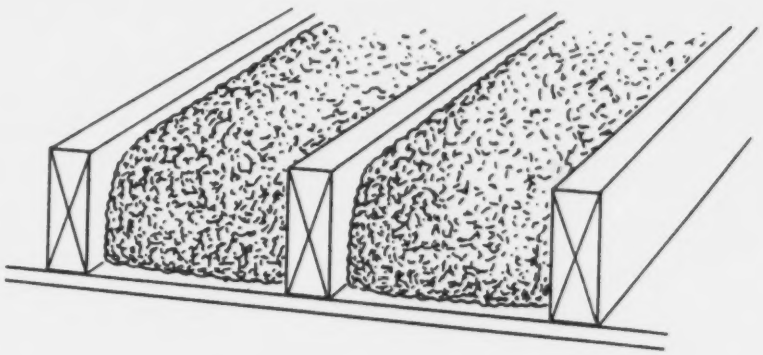
a. reduces heating and cooling expenses
b. reflects sound waves
c. encourages condensation
d. allows rapid temperature changes

_____ 3. Using insulation reduces

a. construction costs
b. ability to retard fires
c. noise transfer
d. all the above

OBJECTIVE 4 **Given drawings, identify types of insulation.**

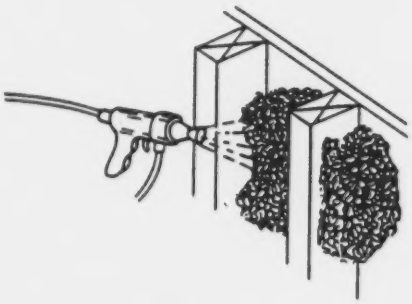
_____ 1. The type of insulation shown below is called _____ insulation.



a. rigid board
b. friction batt
c. corrugated paper
d. blown-in

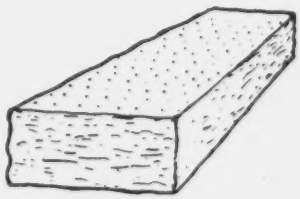
May be photocopied for student use.

_____ 2. The insulation illustrated below is the _____ insulation.



a. foamed plastic
b. flexible blanket
c. adhesive-type
d. flexible batt

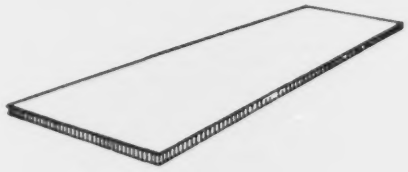
_____ 3. The insulation shown below represents the _____ type.



a. flexible blanket (batt)
b. flexible batt
c. loose-fill
d. reflective roll

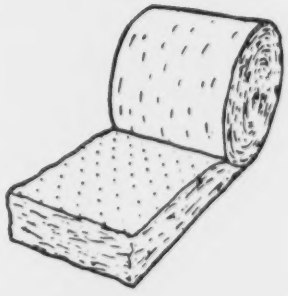
May be photocopied for student use.

_____ 4. This drawing represents the _____ type of insulation.



a. loose-fill
b. rigid board
c. friction batt
d. flexible blanket

_____ 5. What is the type of insulation shown below?



a. corrugated
b. reflective
c. friction-batt (roll)
d. loose-fill

May be photocopied for student use.

OBJECTIVE 5

From a list, choose areas where insulation should be used.

_____ 1. Insulation should be used

a. above ceilings
b. between floor joists
c. in roof structure
d. all the above

_____ 2. Insulation should be used where any surface is exposed to _____

a. overhead stress
b. sunlight
c. vapor condensation
d. thermal exchange

_____ 3. Insulation is needed around

a. interior doors
b. windows and exterior doors
c. interior door jambs
d. interior door headers

OBJECTIVE 6

Select factors that determine the amount of insulation needed for walls, ceiling, and floors.

_____ 1. A factor used to determine the amount of insulation needed is the

a. average low and high outside temperature
b. slope of the roof
c. type of flooring
d. average rainfall in your area

_____ 2. When determining the amount of insulation needed, compare the insulation _____ to the cost of fuel.

a. type
b. thickness
c. cost
d. size

May be photocopied for student use.

OBJECTIVE 7

Make a selection of the types of materials used as vapor barriers.

_____ 1. Types of materials used as vapor barriers include

a. bonded paper
b. drywall
c. mastic film
d. polyethylene film

_____ 2. A type of material used beneath the exterior siding of a structure as a vapor barrier is known as

a. asphalt-coated paper
b. mastic film
c. bonded paper
d. porous bonding

OBJECTIVE 8

Select from a list the methods used to apply insulation and vapor barriers.

_____ 1. The method(s) used to apply insulation include

a. blown in
b. hand-poured
c. stapling
d. all the above

_____ 2. It is common to _____ rigid insulation below a slab.

a. spray
b. lay
c. staple
d. nail

May be photocopied for student use.

_____ 3. Adhesive-type insulation is applied by the _____ method.

a. taped joint
b. nailed
c. sprayed on
d. hand-poured

_____ 4. Loose-fill insulation use the _____ method of application.

a. hand-poured
b. sprayed-on
c. rolled-out
d. taped-edge

_____ 5. Vapor barriers can be

a. installed on the cold and unheated side of walls and ceilings
b. installed using nails, staples, tape, or adhesive
c. made of porous material
d. installed with gaps of 2' or more

OBJECTIVE 9

Objective 9 is evaluated through the completion of an assignment sheet.

May be photocopied for student use.

WRITTEN TEST ANSWERS	INSULATION MATERIALS	A I

OBJECTIVE 1

1. a
2. d
3. b
4. a
5. c
6. c

OBJECTIVE 2

1. c
2. d

OBJECTIVE 3

1. b
2. a
3. c

OBJECTIVE 4

1. d
2. c
3. a
4. b
5. b

OBJECTIVE 5

1. d
2. d
3. b

OBJECTIVE 6

1. a
2. c

OBJECTIVE 7

1. d
2. a

OBJECTIVE 8

1. d
2. b
3. c
4. a
5. b

OBJECTIVE 9

Evaluated on the Assignment Sheet.

CIMC
TEST CODE SHEET

VOCATIONAL PROGRAM (BOOK TITLE) INTRODUCTION TO INSULATION

UNIT NUMBER AND TITLE – A1 – INSULATION MATERIALS

TOTAL NUMBER OF TEST QUESTIONS 28

TOTAL NUMBER OF BASIC SKILL QUESTIONS 12

OBJECTIVE NUMBER	TEST QUESTION NUMBER(S)	BASIC SKILL CODE(S)
1	1-5	S
1	6	X
2	1-2	S
3	1-3	X
4	1-5	X
5	1-3	X
6	1-2	X
7	1-2	X
8	1-5	X
9	Evaluated on the Assignment Sheet	

OBJECTIVE SHEET	INSULATION TOOLS	A 2

INTRODUCTION

The safe and effective use of tools and equipment greatly enhances your ability to install insulation.

Insulation installers are exposed to several hazards and must carefully read tool and equipment safety instructions.

PREREQUISITE

Fundamentals of Construction

UNIT OBJECTIVE

After completing this unit, the student will be able to identify and safely use tools and equipment. The student will demonstrate these competencies by completing the assignment sheet and written test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVES

After completing this unit, the student will be able to:

1. Given a list of terms associated with insulation tools, match them to their correct definitions.
2. From alternatives, choose care and safety guidelines for the use of hand and power tools.
3. Select the correct personnel safety guidelines when installing insulation.
4. Given drawings, identify tools and equipment used to install insulation. (Assignment Sheet)

SUGGESTED ACTIVITIES	INSULATION TOOLS	A 2

PREPARATION

- Review unit and plan presentation.
- Order or obtain materials to supplement unit.
- Introduce unit.

DELIVERY

Objective 1: Given a list of terms associated with insulation tools, match them to their correct definitions.

- Use Information Sheet to discuss terms and definitions associated with insulation.
- Show students examples or illustrations of appropriate terms.
- Explain the importance of knowing the terms and definitions.

Objective 2: From alternatives, choose care and safety guidelines for the use of hand and power tools.

- Use Information Sheet to discuss guidelines for care and safe use of tools and equipment.
- Demonstrate to the students how to sharpen, clean, and store tools properly.
- Demonstrate how the quality and quantity of work increases when using the correct tools and sharp tools as compared to using the wrong tools and dull tools.
- Explain your policy for replacement and repair of damaged tools.
- Outline your tool-management policy for shop and job site.

Objective 3: Select the correct personnel safety guidelines when installing insulation.

- Discuss the safety guidelines presented within the Information Sheets.
- Emphasize that installers must read manufacturer's safety warnings and comply with them.
- View the video tape, "Breathing Easier: Respiratory Protection in the Construction Industry."

APPLICATION

Objective 4: Given drawings, identify tools and equipment used to install insulation. (Assignment Sheet)

- Emphasize that these are the most common tools and equipment. On larger jobs some insulation sprayers may be truck mounted.
- Display examples of tools and equipment listed in this section of the information sheet.
- Allow students to practice identifying tools and equipment.

EVALUATION

Pretest

- Give written test as pretest.
- Determine individual study requirements from pretest results.
- Counsel students individually on pretest results and study requirements.
- Modify materials in unit or create supplementary materials for individual students as required.

Skill Test

- Evaluate students on assignment sheet activities.
- Evaluate students on job sheet activities.

- Complete appropriate section of competency profiles.
- Reteach and reevaluate if necessary.
- Modify materials in unit or create supplementary materials for individual students as required.

Written Test

- Explain to students that they will be asked to demonstrate on the written test actions listed in the specific objectives.
- Give the written test.

  NOTE: The written test may be given in sections if desired.
- Complete appropriate sections of competency profiles.
- Reteach and retest if necessary.
- Review individual and group performance in order to evaluate teaching methods. Adjust scope, sequence, or instructional approaches for additional lessons as required.

SUGGESTED RESOURCES

Electronic Media

- Breathing Easier: Respiratory Protection in the Construction Industry - *The Basics of Respiratory Protection.* AGC of America. 1957 E. Street N.W., Washington, DC 20006, 1993.

UNIT REFERENCES

- Toenjes, Leonard P. *Building Trades Dictionary.* American Technical Publishers, Inc.: Homewood, IL, 1989.
- Wagner, Willis H. *Modern Carpentry.* The Goodheart-Willcox Company, Inc.: South Holland, IL.
- Willey, Al. *Residential Carpentry.* Oklahoma Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, and The Associated General Contractors of America: Stillwater, OK, 1993.

INFORMATION SHEET	INSULATION TOOLS	A 2

OBJECTIVE 1

Given a list of terms associated with insulation tools, match them to their correct definitions.

- **accessories** — devices that are not essential but add to the convenience or effectiveness of a tool or to equipment
- **fiber blowing machine** — equipment used to propel loose-fill materials from a hopper through a hose to the point of application
- **ground fault circuit interruption (GFCI)** — electrical circuits that disconnect electric power tools and equipment to protect personnel from electrical shock. At a construction site, these circuits are commonly built into an extension cord.
- **hopper** — receptacle for delivering material to a fiber blowing machine
- **respirator** — device worn over mouth and nose to protect the respiratory tract
- **thermal insulation** — material used to retard the transfer of heat from inside a structure to the outside and from the outside into the structure

OBJECTIVE 2

From alternatives, choose care and safety guidelines for the use of hand and power tools.

- Hand tools
  - — Use the correct tool for the job.
  - — Inspect tools frequently to make sure they are in good condition.
  - — Keep tools sharp.
  - — Keep tools clean.

- Repair broken or damaged tools promptly.
- Dispose of broken or damaged tools that cannot be repaired.
- Store tools properly when not in use.

  EXAMPLES: Do not carry tools in your pockets; do not place tools where they can roll off; protect cutting edges; lightly oil tools before storing; store tools in dry place.

- Stay alert when using tools.
- Wear eye protection.
- Wear respirator when necessary.

• Power tools and equipment

- Wear hard hat and eye protection.
- Keep tools clean and in good working condition.
- Protect cutting edges.
- Follow manufacturer's maintenance procedure.
- Read and follow operator warnings and instructions.
- Keep accessories such as blades and bits sharp.
- Keep accessories such as hoses, nozzles, jets, and agitators clean.
- Keep hoppers and mixing chambers clean.
- Inspect tools, equipment, and accessories regularly.
- Use caution when attaching a pneumatic fastener to air supply. Point the fastener in a safe direction.

— Keep hands and body away from discharge end of fastener.

— Never point fasteners at anyone.

— Use air pressure specified by manufacturer.

— Do not remove safety devices from tools and equipment.

— Report any unusual noises, sounds, or vibrations to the instructor or supervisor.

— At the construction site, safety regulations require that power tools and electric equipment be connected to GFCI protected circuits.

— Check condition of all equipment before using; always mark damaged tools/equipment and inform your instructor or supervisor.

OBJECTIVE 3 **Select the correct personnel safety guidelines when installing insulation.**

- Safety guidelines

  — Follow all OSHA guidelines.

  — Always wear eye protection and hard hat when operating power tools and equipment.

  — Wear respirator when appropriate.

  — Wear appropriate clothing for job being done.

  NOTE: Always wear tight-fitting clothing that cannot become caught in the moving tool; roll up long sleeves, tuck in shirt tails, and tie back long hair.

  — Do not attempt to operate any tool or piece of equipment before getting approval of instructor or supervisor on that particular machine.

— Do not leave power tool or equipment running unattended. Disconnect the power source.

— Do not distract others or let anyone distract you while operating tools and equipment.

— Be sure all power equipment is properly grounded.

— Be sure that power is disconnected before performing maintenance or changing accessories on equipment.

— Do not use power tools or equipment without guards or safety devices.

— Do not operate electrical power tools if hands or feet are wet.

— Use electric extension cords of sufficient size to service tool or equipment you are using.

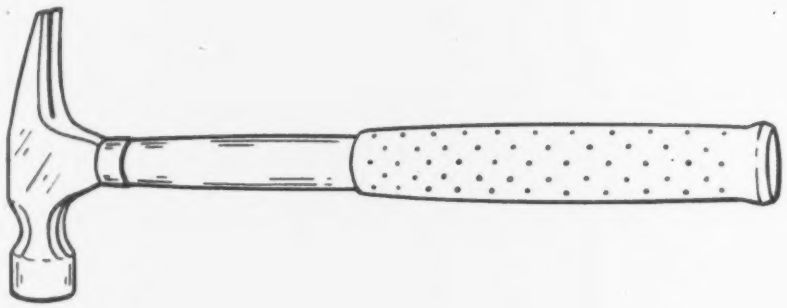
— Carefully read the manufacturer's warnings and instructions before starting the installation.

OBJECTIVE 4

Given drawings, identify tools and equipment used to install insulation. (Assignment Sheet)

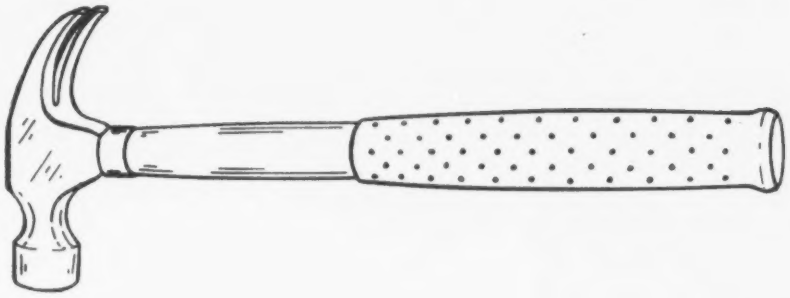
- Straight claw hammer

FIGURE 1



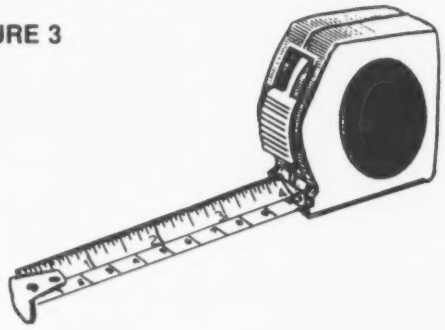
- Curved claw hammer

FIGURE 2



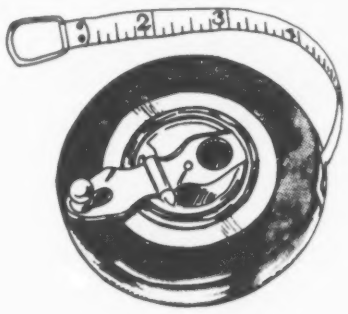
- Steel tape

FIGURE 3



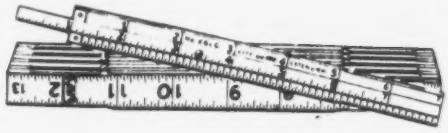
- 100 foot tape

FIGURE 4



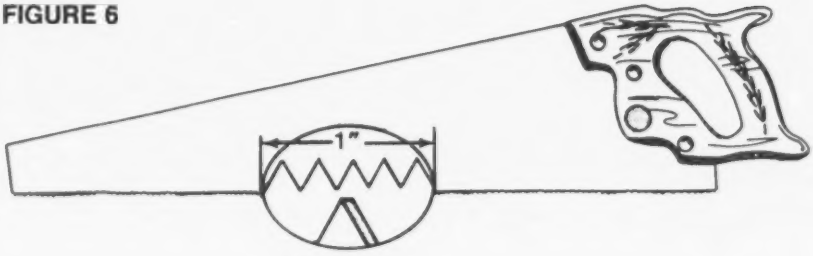
- Folding rule

FIGURE 5



- Ripsaw

FIGURE 6



- Compass saw (keyhole saw)

FIGURE 7

- Utility saw (drywall saw)

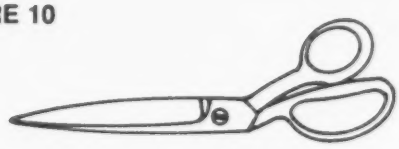
FIGURE 8

- Utility knife

FIGURE 9

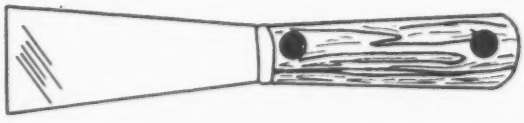
- Shears

FIGURE 10



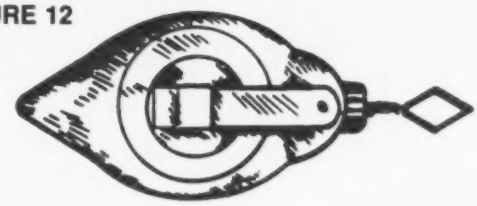
- Putty knife

FIGURE 11



- Chalk box/line

FIGURE 12

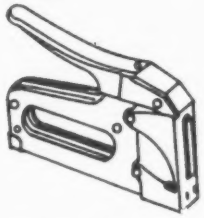


- Straightedge

FIGURE 13

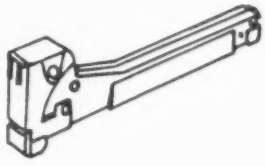
- Staple Gun

FIGURE 14



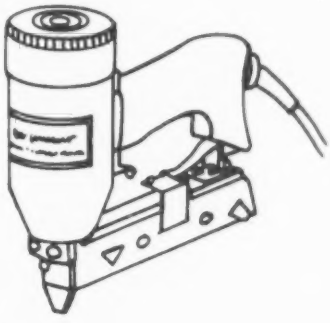
- Hammer Stapler

FIGURE 15



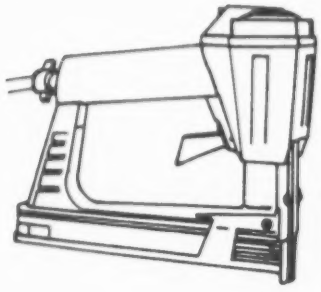
- Electric Stapler

FIGURE 16



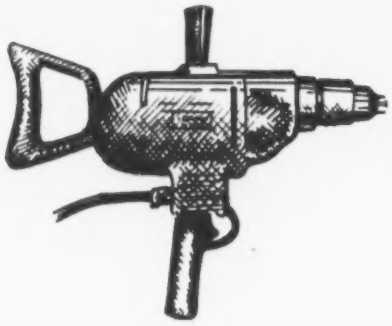
- Pneumatic Stapler

FIGURE 17



- Electric drill

FIGURE 18

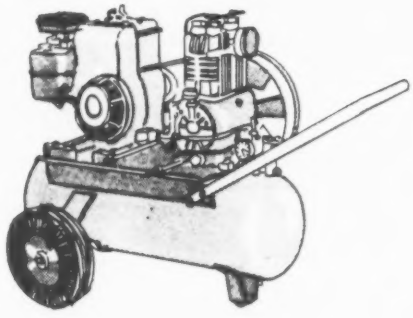


- Caulking gun

FIGURE 19

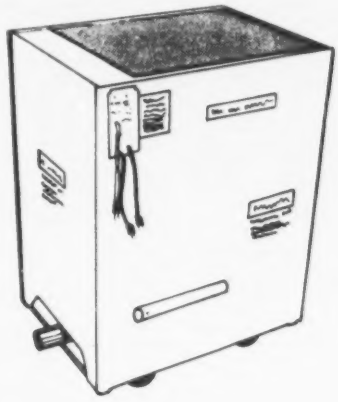
- Air compressor

FIGURE 20



- Fiber blowing machine

FIGURE 21



ASSIGNMENT SHEET	INSULATION TOOLS	A 2

Name _____ Score _____

OBJECTIVE 4

Given drawings, identify tools and equipment used to install insulation.

INTRODUCTION

This exercise will give you practice in the identification of various tools and equipment used to install insulation.

EQUIPMENT AND SUPPLIES

None

INSTRUCTIONS

Identify the following illustrations of tools and equipment used for insulation installation. Write the correct names in the blanks.

Straight claw hammer
Curved claw hammer
Chalk box/line
Pneumatic stapler
Pneumatic stapler
Hammer stapler
Electric drill
Air compressor
Ripsaw
Compass saw
Steel tape
Shears
Utility knife
Utility saw
Fiber blowing machine
100 foot tape
Folding rule
Staple gun
Caulking gun
Electric stapler
Straightedge

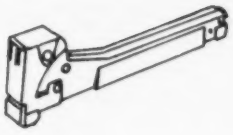
Functional Reading Skills
- Interpret graphics and symbols

Operation and Calculation Skills
- Calculate with whole numbers
- Calculate with fractions
- Solve formulae and equations

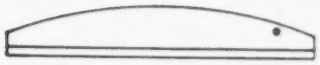
Math Application Skills
- Use English and metric measures

1. _____ 2. _____

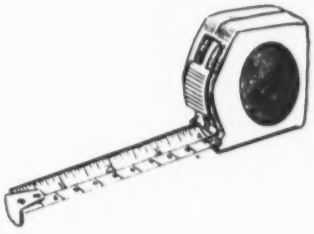
votech



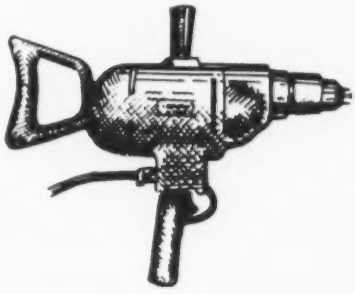
3. _____



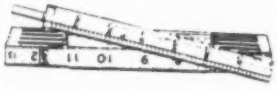
4. _____



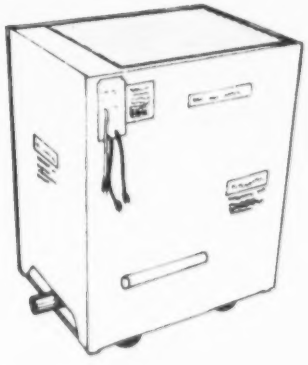
5. _____



6. _____

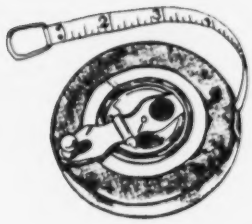


7. _____

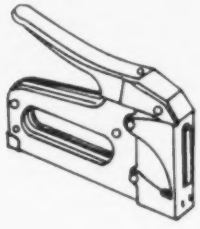


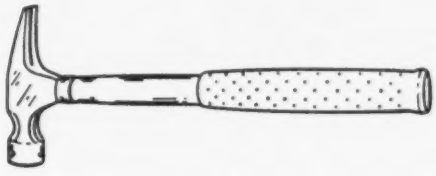
8. _____

votech

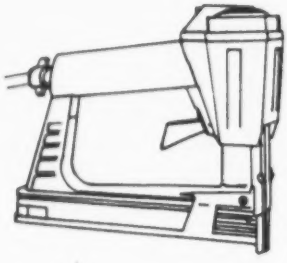


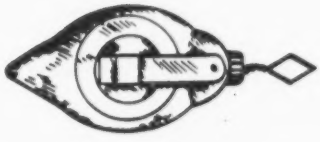
9. _____ 10. _____





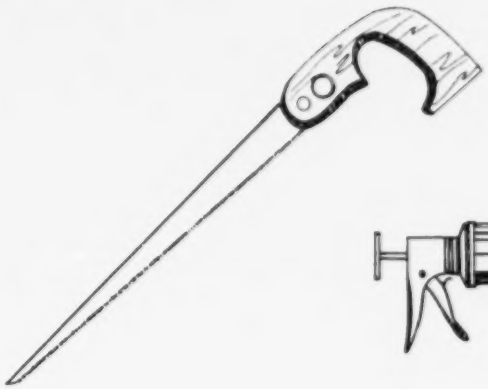
11. _____ 12. _____





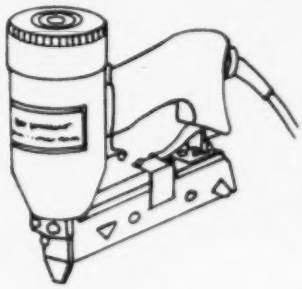
13. _____ 14. _____

votech

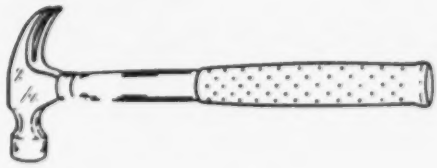


15. _____

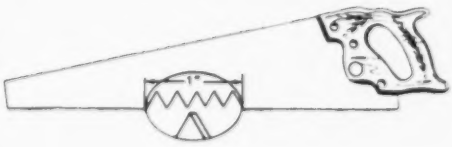
16. _____



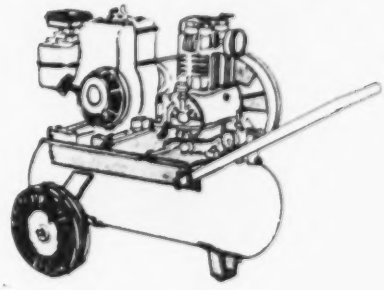
17. _____



18. _____



19. _____



20. _____

votech

ASSIGNMENT ANSWERS	INSULATION TOOLS	A 2

ASSIGNMENT SHEET

1. Utility knife
2. Utility saw
3. Hammer stapler
4. Straightedge
5. Steel tape
6. Electric drill
7. Folding rule
8. Fiber blowing machine
9. Shears
10. Long tape
11. Staple gun
12. Straight claw hammer
13. Pneumatic stapler
14. Chalk box/line
15. Compass saw
16. Caulking gun
17. Electric stapler
18. Curved claw hammer
19. Ripsaw
20. Air compressor

WRITTEN TEST	INSULATION TOOLS	A 2

Name _____ Score _____

OBJECTIVE 1

Given a list of terms associated with insulation tools, match them to their correct definitions. Write the letter that corresponds with the most correct answer.

_____ 1. Devices that are *not* essential, but add to the convenience or effectiveness of a tool or equipment are called

a. safety shields
b. value added
c. guards
d. accessories

_____ 2. GFCI circuits

a. protect personnel from electrical shock
b. provide additional lighting at the construction site
c. increase the power of power tools
d. create electrical problems in equipment

_____ 3. Material used to retard the transfer of heat is called

a. a vapor barrier
b. acoustic insulation
c. thermal insulation
d. an accessory

_____ 4. What is a receptacle for delivering material to fiber blowing machines?

a. Respirator
b. Hopper
c. Hose
d. Tank

May be photocopied for student use.

_____ 5. Equipment used to propel loose-fill material from a receptacle through a hose to the point of application is called a

a. spray pump machine
b. hopper
c. respirator
d. fiber blowing machine

OBJECTIVE 2

From alternatives, choose care and safety guidelines for the use of hand and power tools.

_____ 1. What should be done with broken or damaged tools?

a. Use them as long as possible
b. Repair or replace them
c. Give them to your co-worker
d. Put them back in your tool box for later use

_____ 2. Tools should be

a. kept sharp and clean
b. stored in a dry place
c. inspected frequently
d. all the above

_____ 3. Use the _____ tool for the job.

a. available
b. correct
c. largest
d. damaged

_____ 4. When using hand tools, you should

a. wear eye protection
b. carry tools in your pocket
c. always wear a respirator
d. never store tools in a dry place

May be photocopied for student use.

_____ 5. When using power tools you must *always* wear:

a. a hard hat and gloves
b. a respirator
c. a hard hat and eye protection
d. eye protection only

_____ 6. When attaching a pneumatic fastener to the air supply, you should

a. point it upward
b. lay the fastener on the floor
c. point it downward, but in a safe direction
d. disconnect the other end of the air hose

_____ 7. On all power tools and equipment, you must

a. remove all safety devices from tools and equipment
b. follow manufacturer's operator warnings and instructions
c. use 10% greater air pressure than specified by manufacturer
d. all the above

_____ 8. An excellent safety habit is to always

a. mark damaged tools/equipment
b. leave off safety devices
c. leave sharp saw blades exposed to other workers
d. use pneumatic tools at higher air pressures than specified

OBJECTIVE 3

Select the correct personnel safety guidelines when installing insulation.

_____ 1. Which of the following safety guidelines must *always* be followed when using power tools and equipment?

a. Wear a hard hat
b. Wear gloves
c. Wear a hard hat and eye protection
d. Wear a respirator

May be photocopied for student use.

_____ 2. Which of the following practices is considered *unsafe*?

a. Using power tools while wearing loose fitting clothing
b. Wearing a hard hat and eye protection
c. Using power tools with the approval of your instructor or supervisor
d. Using properly grounded power tools

_____ 3. Before starting to install insulation, using power tools and equipment, you must

a. wear a hard hat
b. wear eye protection
c. read manufacturer's warning and instructions
d. all the above

_____ 4. When working around others that are using power tools

a. do not distract them
b. roll up your shirt sleeves
c. leave the area
d. always wear a respirator

_____ 5. Do *not* operate electrical power tools or equipment if

a. they are properly grounded
b. your hands or feet are wet
c. you are wearing appropriate clothing
d. all the above

_____ 6. Power tools and equipment should be

a. left running unattended
b. used without guards and safety devices
c. disconnected when changing accessories
d. all the above

OBJECTIVE 4

Evaluated by completion of an assignment sheet.

May be photocopied for student use

WRITTEN TEST ANSWERS	INSULATION TOOLS	A 2

OBJECTIVE 1

1. d
2. a
3. c
4. a
5. b
6. d

OBJECTIVE 2

1. b
2. d
3. b
4. a
5. c
6. c
7. b
8. a

OBJECTIVE 3

1. c
2. a
3. d
4. a
5. b
6. c

OBJECTIVE 4

Evaluated by the completion of an assignment sheet.

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CIMC
TEST CODE SHEET

VOCATIONAL PROGRAM (BOOK TITLE) INTRODUCTION TO INSULATION

UNIT NUMBER AND TITLE – A2 – INSULATION TOOLS

TOTAL NUMBER OF TEST QUESTIONS 19

TOTAL NUMBER OF BASIC SKILL QUESTIONS 1

OBJECTIVE NUMBER	TEST QUESTION NUMBER(S)	BASIC SKILL CODE(S)
1	1, 2, 4, 5	X
1	3	S
2	1-8	X
3	1-6	X
4	Evaluated on the Assignment Sheet	

OBJECTIVE SHEET	APPLIED SKILLS — A 3

INTRODUCTION

Installers are required to install insulation safely and effectively. This unit allows you to practice methods and procedures used to perform the installation of various types of insulation.

PREREQUISITE

Fundamentals of Construction

UNIT OBJECTIVE

After completing this unit, the student should be able to install various types of insulation. The student will demonstrate these competencies by completing the job sheets and written test with a minimum of 85 percent accuracy.

SPECIFIC OBJECTIVE

After completing this unit, the student will be able to:

1. Given a list of terms associated with installing insulation, match them to their correct definitions.
2. Select the correct precautions for installing insulation over a steel deck.
3. Identify the most commonly used methods to insulate ceilings, walls, and concrete slabs on-grade.
4. Install a vapor barrier and insulation for a concrete slab on-grade. (Job Sheet 1)
5. Install blanket insulation with an integral vapor barrier in walls. (Job Sheet 2)

SUGGESTED ACTIVITIES	APPLIED SKILLS	A 3

PREPARATION

- Review unit and plan presentation.
- Order or obtain materials needed to supplement unit.
- Introduce unit.

DELIVERY

Objective 1: Given a list of terms associated with installing insulation, match them to their correct definitions.

- Use Information Sheet to discuss terms associated with insulation layout and basic skills.
- Point out the importance of defining terms for common understanding.
- Have students review the terms and definitions.

Objective 2: Select the correct precautions for installing insulation over a steel deck.

- Use Information Sheet to discuss the special precautions that should be used when insulating steel decks.
- Explain the importance of properly installed insulation on fluted steel decks.
- Point out to the students that if the insulation does not span the flutes, walking on it would break it down into the voids. For this reason, thicker insulation must be used when the flutes are wider.
- Discuss how using specially designed insulation would solve a lot of the above problems.

Objective 3: Identify the most commonly used methods to insulate ceilings, walls, and concrete slabs on-grade.

- Use Information Sheet and Transparencies 1, 2, and 3 to discuss methods used to apply insulation and vapor barriers.
- Demonstrate each method discussed in this section of the Information Sheet and relate each method to specific types of insulation.

Objective 4: Install a vapor barrier and insulation for a concrete slab on-grade. (Job Sheet 1)

Objective 5: Install blanket insulation with an integral vapor barrier in walls. (Job Sheet 2)

- Demonstrate the procedures in Jobs Sheets 1 and 2.
- Allow students to practice the procedures in the job sheets,.
- Have the students complete Job Sheets 1 and 2.

EVALUATION

Pretest

- Give written test as pretest.
- Determine individual study requirements from pretest results.
- Counsel students individually on pretest results and study requirements.
- Modify materials in unit or create supplementary materials for individual students as required.

Skill Test

- Evaluate students on assignment sheet activities.
- Evaluate students on job sheet activities.
- Complete appropriate section of competency profiles.

- Reteach and reevaluate if necessary.
- Modify materials in unit or create supplementary materials for individual students as required.

Written Test

- Explain to students that they will be asked to demonstrate on the written test actions listed in the specific objectives.
- Give the written test.

  NOTE: The written test may be given in sections if desired.
- Complete appropriate sections of competency profiles.
- Reteach and retest if necessary.
- Review individual and group performance in order to evaluate teaching methods. Adjust scope, sequence, or instructional approaches for additional lessons as required.

UNIT REFERENCES

- Toenjes, Leonard P. *Building Trades Dictionary.* American Technical Publishers, Inc.: Homewood, IL, 1989.
- Willey, Al. *Commercial Carpentry.* Oklahoma Department of Vocational and Technical Education/Curriculum and Instructional Materials Center, and The Associated General Contractors of America: Stillwater, OK, 1993.

INFORMATION SHEET	APPLIED SKILLS	A 3

OBJECTIVE 1

Given a list of terms associated with insulation, match them to their correct definitions.

- **acoustic barrier** — material used to diminish the flow of sound from one area to another
- **Btu** — abbreviation for British thermal unit and is the amount of heat needed to raise the temperature of one pound of water one degree Fahrenheit
- **compressive strength** — the ability of an insulation to resist a load force that tends to squeeze or shorten it
- **contraction** — the natural tendency of a system or material to shrink because of cold weather
- **expansion** — the natural tendency of a system or material to enlarge because of warm weather or heat
- **K-factor** — amount of heat (in Btu's) transferred in one hour through one square foot of a given material that is one inch thick and has a temperature difference between its surfaces of one degree Fahrenheit
- **permeance** — a measure of a material's resistance to water vapor transmission

  EXAMPLE: The lower the perm rating, the higher the insulation's resistance to water vapor transmission; an insulation rate at 1 perm would theoretically be better than one rated at 2 perm, 3 perm, etc.

- **R-value or R-factor** — an industry standard used to define insulation effectiveness
- **shear strength** — the ability of an insulation to resist splitting

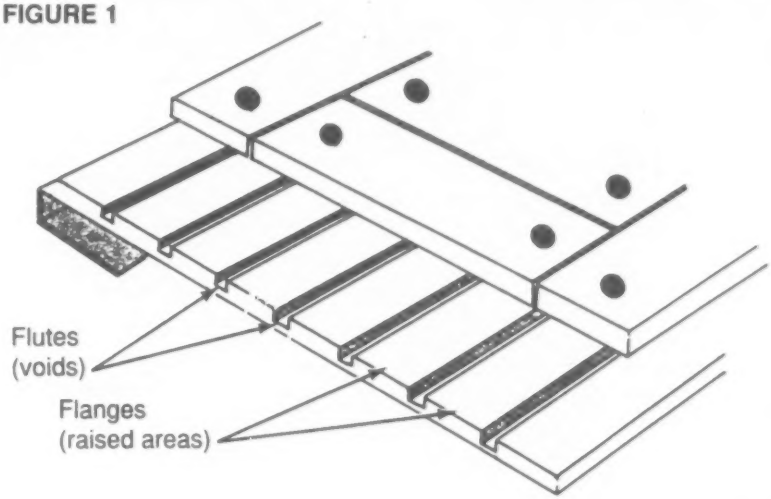
- **substrate** — in a layered material, any component that lies beneath the topmost surface
- **tensile strength** — the ability of an insulation to resist a stress load that tends to pull it apart
- **thermal shock resistance** — the ability of any insulation to withstand rapid temperature changes without physical failure
- **toxic fume** — poisonous gas

OBJECTIVE 2

Select the correct precautions for installing insulation over a steel deck.

- Special precautions for insulation on a steel deck
  - — Insulation board must completely span the flutes in a steel deck and reach as close to center of the flanges as material permits.

FIGURE 1



  - — The wider the flutes in a steel deck, the thicker the insulation must be to facilitate the span.

— Many manufacturers design insulation boards in special thicknesses to span flutes of various widths; this is listed as the insulation's "flute span-ability."

— Without these precautions, workers walking across the insulation board would cause the board to collapse into the flutes or voids. This would damage the board or cause injuries to the worker.

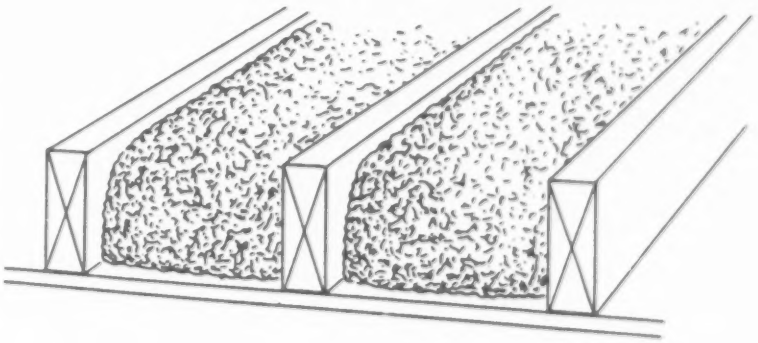
OBJECTIVE 3

Identify the most commonly used methods to insulate ceilings, walls, and concrete slabs on-grade.

- Ceiling insulation

  — Blown-in insulation is the most common type used in ceilings of residential buildings.

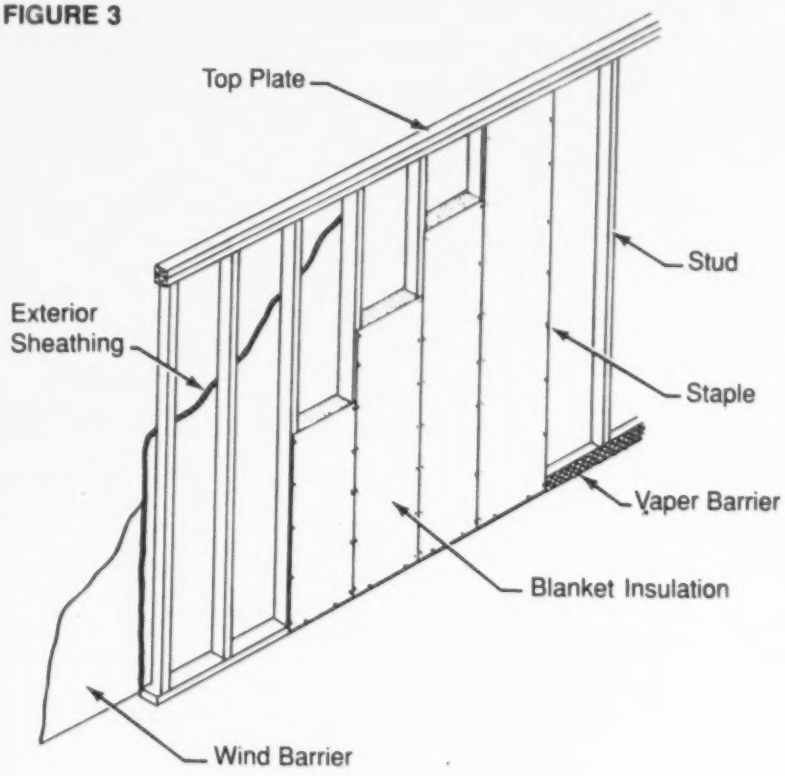
FIGURE 2



— Commercial buildings use a variety of ceiling insulation types depending on the design of the structure.

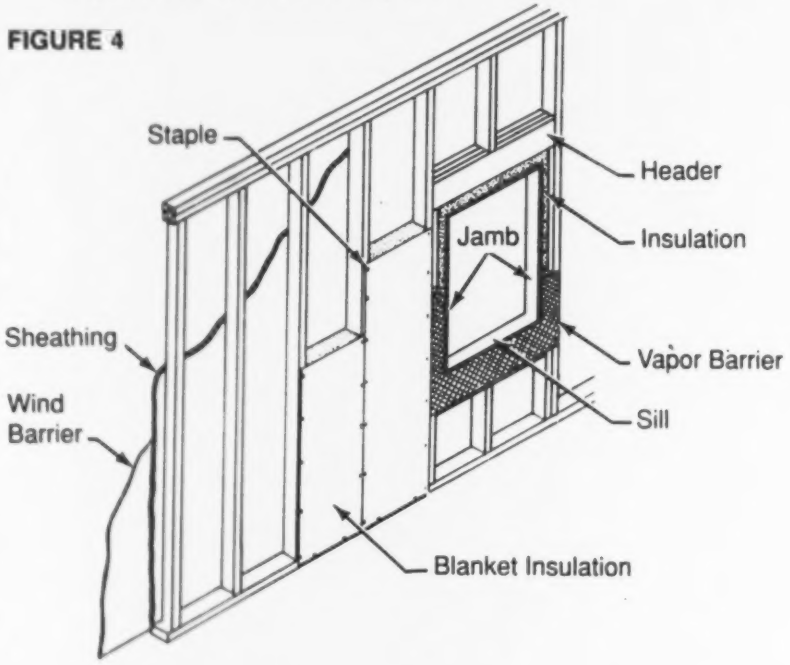
- Wall insulation
  - — Blanket insulation with an integral vapor barrier is popular in both residential and commercial buildings

FIGURE 3



- Openings such as doors and windows require insulation to be cut and placed into cracks. A strip of vapor barrier can be held in place with adhesive or staples.

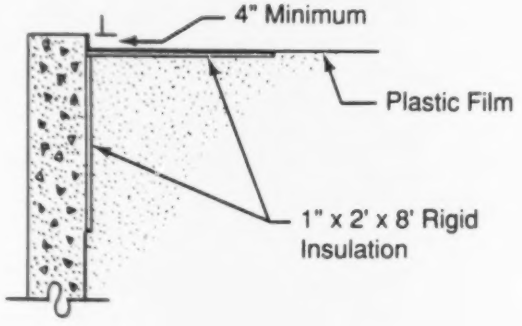
FIGURE 4



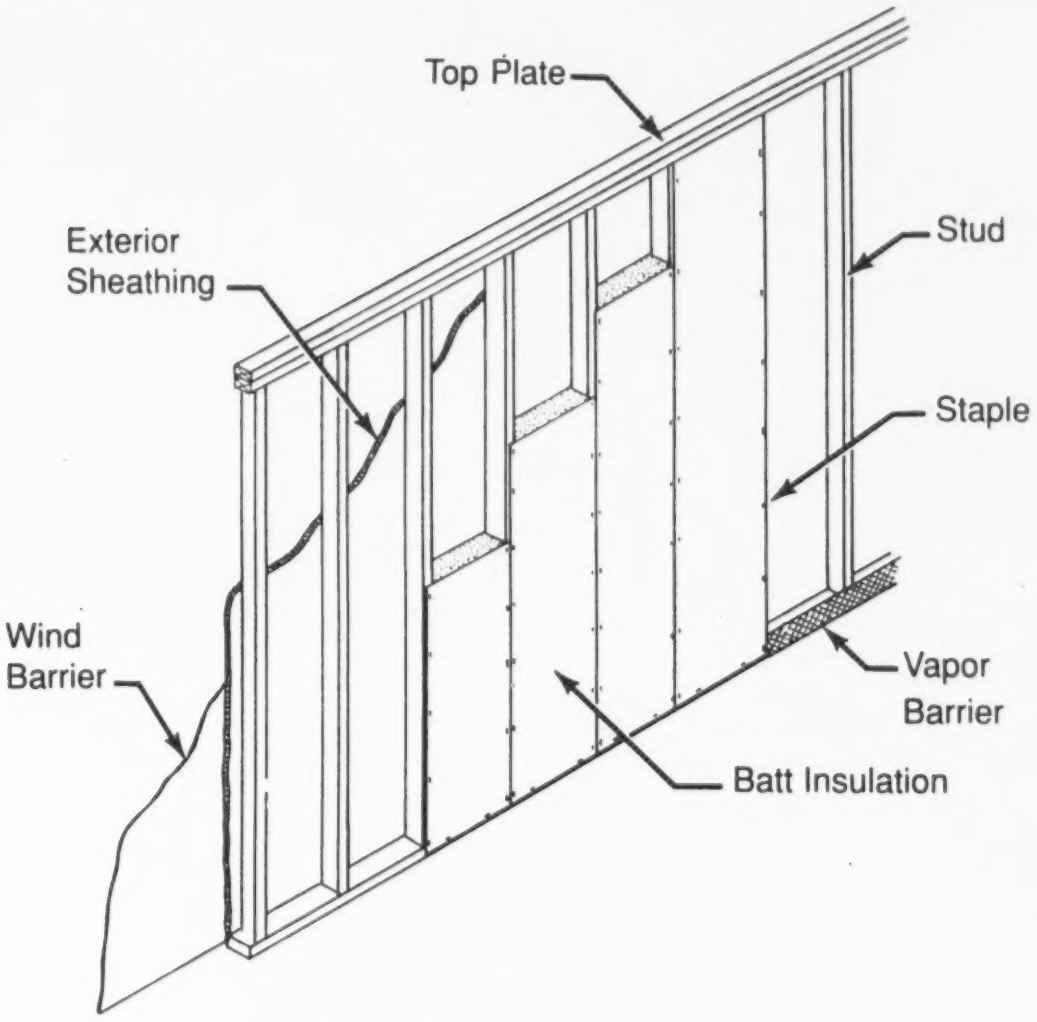
- Perimeter Insulation

  — Rigid insulation and vapor barriers are common to insulate concrete slabs on-grade.

FIGURE 5

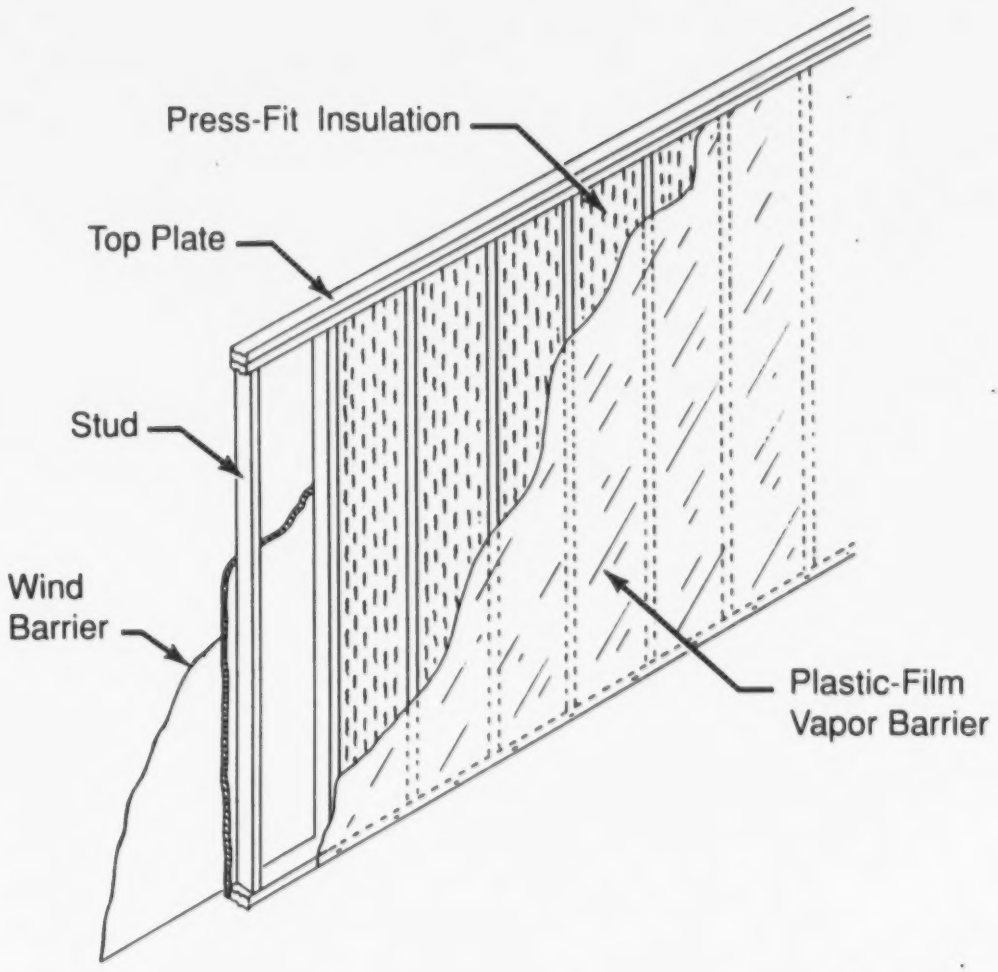


Installation Methods



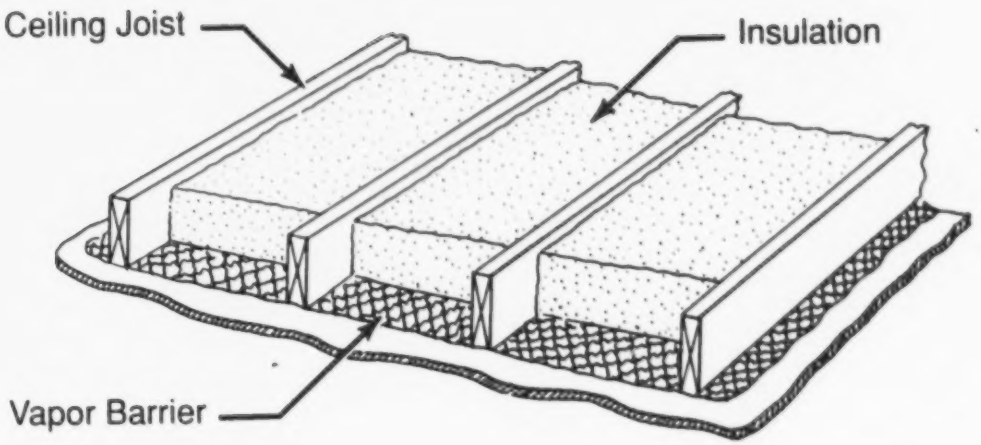
Wall section with batt insulation
(with integral vapor barrier)

Installation Methods
(Continued)



Wall section with press-fit insulation

Installation Methods
(Continued)



Ceiling with fill insulation

JOB SHEET	APPLIED SKILLS	A 3

Name _____ Score _____

OBJECTIVE 4

Install vapor barrier and insulation for a concrete slab on grade.

EQUIPMENT AND SUPPLIES

- Safety goggles and hard hat
- 1″ × 2′ × 8′ rigid insulation
- Polyethylene plastic film
- Mastic or special adhesive
- Utility knife or shears
- Putty knife or pointing trowel
- Steel tape
- Respiratory equipment as recommended by manufacturer and/or MSDS (Material Safety Data Sheet)

PROCEDURE

Research and Reference Skills

- Use standard references

Functional Reading Skills

- Follow written instructions
- Interpret graphics and symbols

Math Application Skills

- Use English and metric measures

		Yes	No
1.	Put on OHSA-required personal protection equipment.	___	___
2.	Clean out along inside of foundation to a depth of 2′-5″ below finish-floor elevation.	___	___
3.	Install rigid insulation on edge along the inside of the two long sides of the foundation.	___	___
4.	Be sure that below slab fill is graded to proper elevation for floor slab, then remove enough fill material around the foundation's perimeter to allow for the 1-inch insulation.	___	___

Functional Math Skills

- Make measurements

General Science Skills

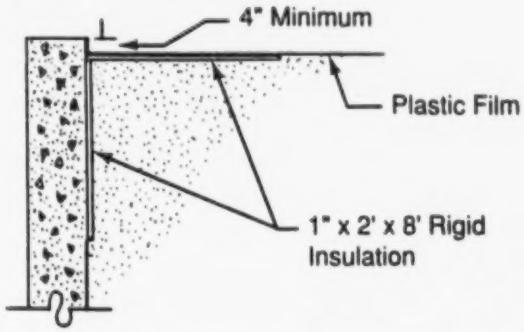
- Use scientific instruments

Job Acquisition/ Development Skills

- Master specific job task/procedure
- Practice good work habits/attitudes

	Yes	No
5. Install horizontal pieces of insulation around the inside perimeter of the foundation, lapping the pieces over the top of the vertical pieces and placing them tightly against the foundation.	___	___
6. Lay a roll of plastic film at one end of the floor base and roll out film to the other end.	___	___
7. Unfold length of plastic and lay out flat on the sand fill.	___	___

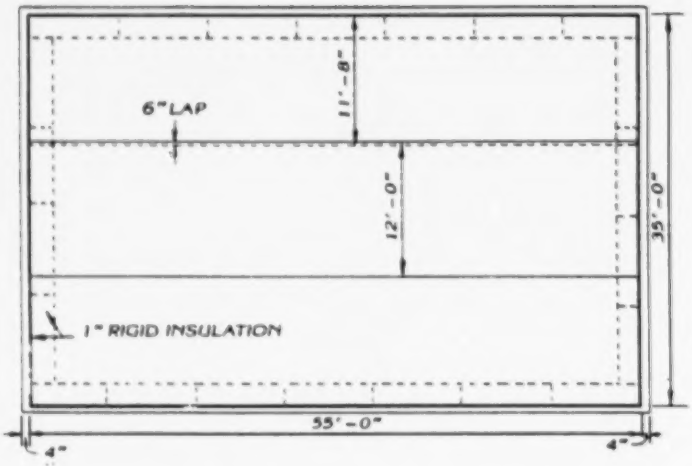
FIGURE 6



8. Roll out another piece of plastic to length and cut.	___	___
9. Unfold this length and lay out on sand fill.	___	___
10. Continue following the procedures in steps 8 and 9 until entire area is covered.	___	___

Yes No

FIGURE 7



11. Use the mastic or adhesive to seal the seams where the plastic strips overlap and to hold the ends. ___ ___

12. Clean up area and put away equipment and supplies. ___ ___

(End of Job Sheet)

SKILL TEST RECORD

EVALUATOR'S COMMENTS

PRODUCT EVALUATION

Evaluator note: Rate the student on the following criteria by circling the appropriate numbers. Each criterion must receive a rating of "3" or higher to demonstrate student mastery. (See Performance Evaluation Key.) A student who is unable to demonstrate mastery should review the material and submit another product for evaluation.

Criteria:

Joints are tight to $\frac{1}{8}$"	4	3	2	1
Lap insulation to $\frac{1}{4}$"	4	3	2	1
Overlap plastic ($\pm\frac{1}{2}$")	4	3	2	1

EVALUATOR'S COMMENTS

_____

_____

_____

AVERAGE RATING

Evaluator note: To obtain an average rating for the Competency Profile, total the designated points in "Product Evaluation" and divide by the total number of criteria. Circle the rating on the "Performance Evaluation Key" below.

PERFORMANCE EVALUATION KEY

4 **Skilled** Can perform job with no additional training
3 **Moderately Skilled** Has performed job during training program; limited additional training may be required
2 **Limited Skill** Has performed job during training program; additional training is required to develop skill
1 **Unskilled** Is familiar with process, but is unable to perform job

JOB SHEET 2	APPLIED SKILLS	A 3

Name _____ Score _____

OBJECTIVE 5 **Install blanket insulation with integral vapor barrier in walls.**

TOOLS AND EQUIPMENT

- Safety goggles and hard hat
- Utility knife or shears
- Hand or pneumatic stapler
- Staples
- Tape measure
- Insulation batts
- Pencil
- Respiratory equipment as recommended by manufacturer and/or MSDS
- Vapor barrier material

PROCEDURE

Research and Reference Skills
- Use standard references

Functional Reading Skills
- Follow written instructions
- Interpret graphics and symbols

Math Application Skills
- Use English and metric measures

		Yes	No
1.	Put on OSHA-required personal protection equipment.	___	___
2.	Measure vertical distance to be filled with insulation, and add 3 inches to that measurement. **NOTE:** Insulation should be 3 inches longer than the space to be filled; this allows enough length so that some of the batting can be removed from both ends to allow nail flanges on top and bottom.	___	___
3.	Mark on the floor the length determined in step 2.	___	___

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Functional Math Skills
- Make measurements

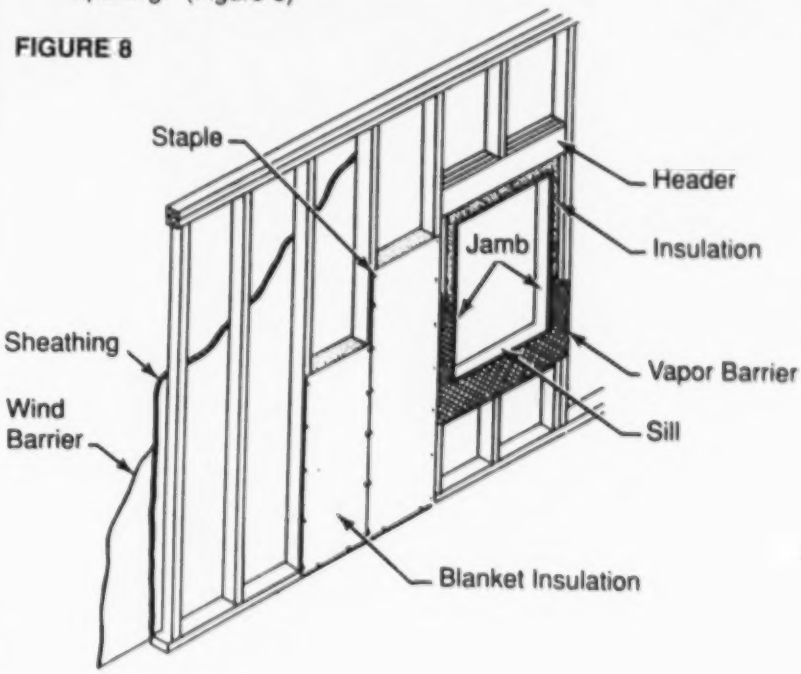
General Science Skills
- Use scientific instruments

Job Acquisition/ Development Skills
- Master specific job task/procedure
- Practice good work habits/attitudes

	Yes	No
4. Roll out insulation between marks on floor and cut insulation to length.	___	___

NOTE: Save cut-off ends and pieces so that they may be used to fill small spaces around windows, doors, electrical boxes, and any other small opening. (Figure 8)

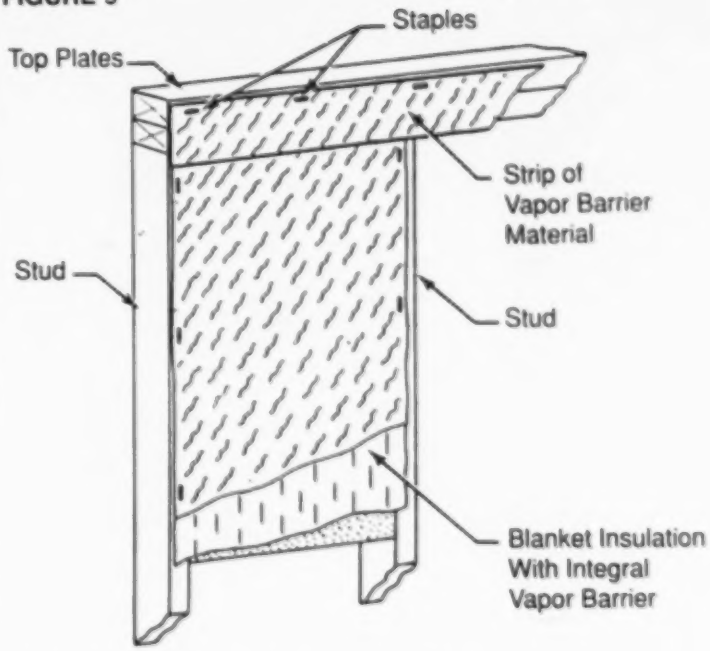
FIGURE 8



Yes No

4A. Alternate method

FIGURE 9



5. Make nail flanges by removing 1½ inches of batting from the insulation's covering on each end of the cut length. — —

   NOTE: Sides are normally pre-cut with 1½" nailing flanges/tabs.

6. Place insulation in wall opening with nail flange over top plate and side tabs over studs; carefully fit and cut insulation around pipes, conduits, electrical boxes, and window and door frames. (Figure 8) — —

		Yes	No
7.	Place insulation behind electrical boxes.	___	___
8.	Staple the top nail flange to top plate and then, working from top to bottom, placing staples no more than 12 inches apart.	___	___
9.	Staple bottom nail flange to soleplate.	___	___
10.	Follow procedures until all walls are insulated.	___	___
11.	Check to see that no openings were missed and that all the insulation is properly installed; fill these openings as necessary. **NOTE:** In areas where no vapor barrier exists, such as headers, below window openings, etc.; add these barriers.	___	___
12.	Clean up area and put away equipment and supplies.	___	___

(End of Job Sheet)

SKILL TEST RECORD

EVALUATOR'S COMMENTS

_____

_____

_____

PRODUCT EVALUATION

Evaluator note: Rate the student on the following criteria by circling the appropriate numbers. Each criterion must receive a rating of "3" or higher to demonstrate student mastery. (See Performance Evaluation Key.) A student who is unable to demonstrate mastery should review the material and submit another product for evaluation.

Criteria:

Insulation tightly fitted (1/4")	4	3	2	1
Vapor barrier is continuous	4	3	2	1
Insulation behind electrical boxes	4	3	2	1
Properly stapled (12"±1)	4	3	2	1

EVALUATOR'S COMMENTS

_____

_____

_____

AVERAGE RATING

Evaluator note: To obtain an average rating for the Competency Profile, total the designated points in "Product Evaluation" and divide by the total number of criteria. Circle the rating on the "Performance Evaluation Key" below.

PERFORMANCE EVALUATION KEY

4 **Skilled** – Can perform job with no additional training
3 **Moderately Skilled** – Has performed job during training program; limited additional training may be required
2 **Limited Skill** – Has performed job during training program; additional training is required to develop skill
1 **Unskilled** – Is familiar with process, but is unable to perform job

WRITTEN TEST	APPLIED SKILLS	A 3

Name _____ Score _____

OBJECTIVE 1

Given a list of terms associated with installing insulation, match them to their correct definition. Write the letter that corresponds to the most correct answer.

_____ 1. A measure of the effectiveness of a material to provide thermal insulation is called

a. T-value
b. Btu
c. R-value
d. S-factor

_____ 2. Poisonous gas is also called

a. toxic fume
b. Btu gas
c. K-factor
d. inhibitor

_____ 3. The ability of an insulation to resist splitting is known as

a. permeance
b. shear strength
c. contraction factor
d. compressive strength

_____ 4. What is a measure of a material's resistance to water vapor transmission?

a. Tensile strength
b. Permeance
c. K-factor
d. All the above

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_____ 5. In a layered material, what is any the component that lies beneath the topmost surface?

a. Under-coat
b. Barrier
c. Substrate
d. Btu layer

_____ 6. The natural tendency of a system or material to expand because of warm weather or heat is known as

a. contraction
b. substrate
c. thermal bonding
d. expansion

_____ 7. What is the ability of an insulation to resist a load force that tends to squeeze or shorten it?

a. Tensile strength
b. Contraction
c. Expansion
d. Compressive strength

_____ 8. The natural tendency of a system or material to contract because of cold weather is known as

a. contraction
b. contraction bonding
c. expansion
d. compression

OBJECTIVE 2

Select the correct precautions for installing insulation over a steel deck.

_____ 1. Insulation board must completely span the _____ in a steel deck.

a. flanges
b. flutes
c. rails
d. raised areas

May be photocopied for student use.

_____ 2. The wider the flutes in a steel deck, the _____ the insulation board must be.

a. thinner
b. weaker
c. longer
d. thicker

_____ 3. What is the purpose of following insulation precautions on a steel deck?

a. To reduce the damage to the insulation board and to prevent worker injuries
b. To prevent wind damage
c. To improve the insulating ability of the insulation board
d. To enhance the insulating ability and retard vapor penetration

OBJECTIVE 3

Identify the most commonly used methods to insulate ceilings, walls, and concrete slabs on-grade.

_____ 1. The most common insulation used in residential ceilings is

a. urethane foam
b. rigid insulation
c. blown-in insulation
d. insulation board

_____ 2. A commonly used wall insulation is

a. blanket insulation with an integral vapor barrier
b. urethane foam
c. blown-in insulation
d. urethane foam with a coating of silicone

May be photocopied for student use.

_____ 3. What method is needed to insulate around doors and windows?

a. Spray urethane foam into cracks
b. Cut and place insulation into cracks
c. Nail insulation board over cracks
d. Cut strips of rigid board and place over cracks

_____4. Concrete slab on-grade are often insulated by use of

a. blanket insulation
b. urethane insulation
c. reflective insulation
d. rigid insulation and a vapor barrier

OBJECTIVES 4 & 5

Evaluated by the completion of job sheets.

May be photocopied for student use.

WRITTEN TEST ANSWERS	APPLIED SKILLS	A 3

OBJECTIVE 1

1. c
2. a
3. b
4. b
5. c
6. d
7. d
8. a

OBJECTIVE 2

1. b
2. d
3. a

OBJECTIVE 3

1. c
2. a
3. b
4. d

OBJECTIVE 4 & 5

Evaluated by the completion of job sheets.

CIMC
TEST CODE SHEET

VOCATIONAL PROGRAM (BOOK TITLE) INTRODUCTION TO INSULATION

UNIT NUMBER AND TITLE – A3 – APPLIED SKILLS

TOTAL NUMBER OF TEST QUESTIONS 15

TOTAL NUMBER OF BASIC SKILL QUESTIONS 7

OBJECTIVE NUMBER	TEST QUESTION NUMBER(S)	BASIC SKILL CODE(S)
1	1-4, 6-8	S
1	5	X
2	1-3	X
3	1-4	X
4-5	Evaluated on Job Sheets	

INTRODUCTION TO INSULATION
COMPETENCY PROFILE

Student _____ Soc. Sec. No. ___ – ___ – ____
Last First MI

PROGRAM Grade 9 10 11 12 Adult SCHOOL

INSTRUCTOR SCHOOL ADDRESS PHONE

STUDENT'S HOME ADDRESS DATE OF BIRTH PHONE

STUDENT'S EMPLOYER ADDRESS PHONE

CONTACT IN CASE OF EMERGENCY PHONE

ADDRESS

OR

ADDRESS PHONE

The above information can be used for school records and/or to ensure safety of students. This confidential information is not to be released to employers or to the general public.

ON-THE-JOB TRAINING/WORK EXPERIENCE

DURATION OF EMPLOYMENT	JOB TITLE	EMPLOYER	SUPERVISOR'S NAME	ADDRESS OF EMPLOYER	PHONE

This agency does not discriminate on the basis of race, creed, color, national origin, sex, age, veteran status, qualified handicap, or disability.

Duplicate one copy for each student.

SPECIFIC JOB COMPETENCIES

DIRECTIONS: Evaluate the trainee using the rating scale below, and check the appropriate number to indicate the degree of competency. The numerical ratings of 4, 3, 2, 1, and 0 are not intended to represent the traditional school grading system of A, B, C, D, and F. The descriptions associated with each of the numbers focus on level of student performance for each of the tasks listed below.

Rating Scale:
4 — Skilled — can perform job independently with no additional training.
3 — Moderately Skilled — has performed job independently during the training program; limited additional training may be required.
2 — Limited Practice — has practiced job during training program; additional training is required to develop skill.
1 — Exposure Only — general information provided with no practice time; close supervison needed and additional training required.
0 — No Exposure — no information or practice provided during training program; complete training required.

UNIT A1

4	3	2	1	0

Insulation Materials

1. Given a list of terms associated with insulation, match them to their correct definitions.
2. From alternatives, choose the correct functions of the two basic kinds of insulation.
3. Select from a list benefits of using insulation in a structure.
4. Given drawings, identify types of insulation.
5. From a list, choose areas where insulation should be used.
6. Select factors that determine the amount of insulation needed for walls, ceilings, and floors.
7. Make a selection of the types of materials used as vapor barriers.
8. Select from a list the methods used to apply insulation and vapor barriers.
9. Estimate the materials required to insulate a structure.
10. _____

WRITTEN TEST SCORE _____

UNIT A2

4	3	2	1	0

Insulation Tools

1. Given a list of terms associated with insulation tools, match them to their correct definitions.
2. From alternatives, choose care and safety guidelines for the use of hand and power tools.
3. Select the correct personnel safety guidelines when installing insulation.
4. Given drawings, identify tools and equipment used to install insulation.
5. _____

WRITTEN TEST SCORE _____

UNIT A3

4	3	2	1	0

Applied Skills

1. Given a list of terms associated with installing insulation, match them to their correct definitions.
2. Select the correct precautions for installing insulation over a steel deck.
3. Identify the most commonly used methods to insulate ceilings, walls, and concrete slabs on-grade.
4. Install a vapor barrier and insulation for a concrete slab on-grade.
5. Install blanket insulation with an integral vapor barrier in walls.
6. _____

WRITTEN TEST SCORE _____

BEST COPY AVAILABLE

Use of This Document

Use of this document can be used to record information about the student and the skills mastered by the student. This information is useful in documenting student progress during the training program and to provide information about the student's qualifications to potential employers and for entry into advanced training programs. Instructors using AGC-CIMC instructional materials are authorized to reproduce this document as required for use in their training programs.

INTRODUCTION TO INSULATION

CIMC

READING SKILLS

CIM

WRIT.

	Reading Comprehension										Research and Reference								Functional Reading							Language		Composition					
UNITS OF INSTRUCTION	Gain factual information	Distinguish fact, opinion and inference	Recognize stereotyping and bias	Recognize propaganda	Analyze cause and effect	Draw conclusions	Make generalizations	React to written material	Apply word analysis techniques		Select useful resources	Locate resources	Find materials in library	Use standard reference	Use in-book reference tools	Use audiovisual media	Use computer data base	Use magazines and newspapers	Interpret forms and records	Follow written instructions	Interpret graphics and symbols	Use content area vocabulary	Interpret abbreviations/acronyms	Read aloud	Use standard grammar and correct spelling, punctuation, and capitalization	State ideas clearly	Use complete sentences	Develop preliminary outline	Use topic sentences	Use introductory/closing paragraphs	Compose reports	Compose essays	Proofread and edit	Construct graphics and symbols
1. Insulation Materials																					●											
2. Insulation Tools																					●											
3. Insulation Applied Skills														●					●	●	●											

CIMC BASIC SKILLS DOCUMENTATION MATR

WRITING SKILLS

MATH SKILLS

Composition				Research					Functional Writing						Operation and Calculation											Math Application										Data Analysis and Display							
Compose reports	Compose essays	Proofread and edit	Construct graphics and symbols	Take notes	Use notecards	Create bibliography	Use footnotes	Outline material	Complete forms and records	Write instructions	Write letters	Write job applications	Write resumes	Use word processing	Use computer graphics	Round off numbers	Estimate answers	Use scientific notations	Use exponential notations	Calculate with whole numbers	Calculate with fractions	Calculate with decimals	Convert whole numbers to fractions	Convert whole numbers to decimals	Solve numerical expressions	Solve formulae and equations	Obtain squares and square roots	Convert units of measure	Perform metric calculations	Solve word problems	Select/apply mathematical formula	Select/apply mathematical procedure	Use English and metric measures	Solve time/rate/distance problems	Solve ratio/proportion problems	Solve percent problems	Apply techniques of scaling	Apply algebra principles	Apply geometry principles	Apply trigonometry principles	Interpret charts and tables	Interpret graphs (type)	Collect /record data	Apply sampling techniques	Apply principles of probability	Construct charts and tables	Construct graphs	Calculate statistics	Interpret statistics	Interpret blueprints/plans
																●	●			●	●					●	●						●	●													
																●	●			●	●					●	●						●	●													
																																	●														

ATRIX

SCIENCE SKILLS

94-010745

Functional Math													General Science									Life Science										Physical Science										Earth Science									
Calculate statistics	Interpret statistics	Interpret blueprints/plans	Make measurements	Perform banking transactions	Make change	Solve practical problems	Calculate gross earnings	Solve income/expense problems	Prepare a budget	Calculate interest	Solve interest problems	Calculate sales tax	Determine income tax	Use calculator for computation	Use computer for computation	Use computer spreadsheets	Apply computing skills	Apply scientific method of inquiry	Conduct experiments	Investigate science ethics	Investigate science history	Investigate/apply economics in technology	Use scientific instruments	Investigate/apply technology	Collect specimens	Identify/classify living organisms	Investigate biological history of the earth	Investigate food chains, webs, pyramids	Investigate/apply principles of human development	Investigate/apply principles of genetics/heredity	Investigate/apply principles of anatomy/physiology	Investigate health issues	Analyze/classify matter	Investigate forms/changes of matter	Investigate forms/changes of energy	Investigate/apply chemical properties	Investigate/apply physical laws	Investigate physical characteristics of the earth	Investigate geological history of the earth	Investigate physical forces acting on the earth	Solve problems of longitude, latitude, and time zones	Investigate conservation of physical resources	Investigate conservation of living resources	Investigate issues of environmental impact	Apply science principles to environmental issues
			●																				●																										

CIMC

ORAL COMMUNICATION SKILLS

INTE

THE ASSOCIATED GENERAL CONTRACTORS OF AMERICA

UNITS OF INSTRUCTION

	Oral Presentation								Listening			Interactive Communication									General Training								
	Make informative presentations	Make persuasive presentations	Present personal opinion/viewpoint	Use good speaking techniques	Select/use words effectively	Use effective body language	Present appropriate appearance	Integrate audio and/or visual materials in oral presentations	Adapt presentation to specific audience	Apply active listening skills	Distinguish fact, opinion, and inference	Draw conclusions/make generalizations	Analyze/identify point of view	Give/follow oral directions	Apply questioning techniques	Conduct/receive interviews	Analyze/apply nonverbal communication	Work effectively in a group	Communicate with clients/customers/patients	Communicate with co-workers	Communicate with supervisors	Communicate with professional colleagues/ associates	Apply telephone etiquette	Investigate/apply communication process models	Analyze/apply nonverbal communication	Investigate/apply cross-cultural communication	Interact with co-workers	Interact with supervisors	Interact with clients/customers/patients	Interact with professional colleagues/associates	Interact with family/friends	Participate in group activities	Participate in industrial relations/functions	Identify personal values/attitudes	Apply information to life experiences	Identify values/attitudes
1. Insulation Materials																																		
2. Insulation Tools																																		
3. Insulation Applied Skills																																		

* Use this line for entering your state or local codes for graduation requirements or learner outcomes.

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Developer of the Nation's Best

TERPERSONAL OR RELATING SKILLS

Teamwork Cooperation

- Identify values/attitudes
- Identify needs/drives
- Select/apply appropriate behavior
- Investigate/identify personal styles
- Investigate/identify group/corporate climate
- Give/receive feedback
- Identify hidden purposes
- Investigate/apply group dynamics
- Control undesirable/inappropriate behavior
- Resolve conflicts
- Clarify goals/objectives
- Devise "win/win" situations
- Build consensus
- Generate ideas
- Present point of view

Leadership Influence

- Analyze/apply leadership styles
- Analyze/apply management styles
- Obtain confidence of others
- Develop esteem in self/others
- Persuade others
- Analyze/apply motivation techniques
- Provide positive coaching

CREATIVE THINKING/ PROBLEM SOLVING SKILLS

Cognitive Activities

- Collect/record information
- Identify critical elements/issues
- Define a problem
- Identify underlying causes
- Apply a problem-solving model
- Analyze/synthesize information
- Identify/analyze underlying assumptions
- Draw conclusions
- Predict results/outcomes
- Identify/evaluate consequences
- Identify/develop alternatives
- Evaluate alternatives
- Select an alternative
- Devise a solution
- Create a finished product
- Apply intuitive/creative thinking processes
- Transfer knowledge/training to new situations
- Apply new technology
- Develop an action plan
- Evaluate results/outcomes

EMPLOYAE

Job Search Selection

- Analyze personal occupational aptitudes/preferences
- Investigate employment prospects of a career field/occupation
- Investigate training requirements for a career field/occupation
- Investigate benefits of a career field/occupation
- Compare/evaluate career options
- Develop personal career path
- Locate appropriate jobs
- Analyze duties/requirements/benefits of specific job
- Master specific job task/procedure
- Fill in job-related applications
- Write letter of application
- Write personal resume

OYABILITY SKILLS

SOCIAL STUDIES SKILLS

Job Aquisition/ Development										Information Analysis					Social Studies Application											Functional Social Studies										
Master specific job task/procedure	Fill in job-related applications	Write letter of application	Write personal resume	Interview for a job	Apply business etiquette	Practice good work habits/attitudes	Develop good personal presentation	Develop self-confidence/esteem	Develop effective leadership	Deal effectively with supervisors	Deal effectively with co-workers	Deal effectively with professional colleagues/associates	Deal effectively with customers/clients	Collect/record data	Interpret graphical information	Construct graphical information	Interpret maps/globes	Interpret statistical information	Analyze/interpret demographic information	Investigate/apply U.S. history	Investigate/apply world history	Investigate/apply U.S. geography	Investigate/apply world geography	Investigate/apply principles of government/politics	Investigate/apply principles of economics	Investigate/apply principles of ethics	Investigate/apply principles of psychology	Investigate/apply principles of sociology	Investigate/apply cross-cultural studies	Practice responsible personal economics	Prepare a personal budget	Use credit responsibly	Practice good work ethics	Participate in industrial relations	Interact with people of different races/cultures	Investigate/participate in government	Investigate/apply American legal practices	Select/use sources of information on current events	Analyze current events	Analyze consumer issues	Analyze social issues	Analyze conservation/ecology issues	Analyze social impact of science/technology	Analyze economic impact of science/technology
●																																				
	●					●																														

Education

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